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October 30, 1930

Water Supplies in British India
HAROLD E. BABBITT

Levee Protection on the Mississippi
H. V. PITTMAN

Gantry Cranes of Welded Design
R. F. BESSEY

Bridge Lighting Practice
MARCUS S. GILBERT

Trusses With Polygonal Web Systems
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Constructing the Calderwood Dam

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, OCTOBER 30, 1930 Number 18

Detroit's Vehicular Tunnel

THIS week will see the formal opening of the vehicular tunnel under the Detroit River between Detroit, Mich., and Windsor, Ont. Special interest attaches to this new trafficway not only because of its international character and the problem of providing for customs inspection but also because it is the first vehicular tunnel to be built as a private undertaking. As in the case of the tunnel at Oakland, Calif., the first cost has been reduced by using a single tube, in which traffic moves in both directions on a 22-ft. roadway. At Detroit, however, a new factor is introduced by the large number of interurban buses which are expected to use the tunnel. Their effect upon the speed of traffic and hence upon the capacity of the tunnel will be watched with interest. Cross-river traffic at Detroit is now handled by ferries and by the Ambassador Bridge, opened about a year ago. To date, the bridge has not done as well as had been expected, the ferries having reduced their rates in a successful attempt to meet the new competition. As the tunnel will compete more directly with the ferries for traffic from downtown Detroit to Windsor, it should be more successful than the bridge in obtaining a fair share of the traffic through being able to show a definite saving in time over the existing routes. Its economic results will still have to prove themselves. Its success as an engineering and construction operation carried to completion ahead of schedule and at less than the estimated cost is signalized by its inauguration.

More Than a Gesture Needed

THE proposal emanating from Washington to make available at once the 1932 federal-aid appropriation for road building raises the very pertinent question of what can be done to convert the commitment of $125,000,000 into actual cash with which to pay for labor and materials. It is unfortunate that hard facts spoil a fine gesture, but they have to be noted. Federal-aid money cannot be used until it is matched at least dollar for dollar by the states. Many states cannot, unless they undertake additional financing, match dollars with more federal-aid dollars than the normal yearly allotment. And the extra financing is difficult or impossible because taxpayers are unlikely to support any financing of highways which reaches much beyond the resources of present income. What the Washington proposal does is to say, in effect: The money promised you for 1932 is yours to spend now, but only if you meet the conditions, and since your finances are not organized to meet them until a year or two from now you will have to reorganize your finances. The situation that presents itself, then, is that the states must increase their present income, or else capitalize future income in bond issues. Either of these alternatives faces such opposition as to warrant the assertion that a new policy must be established if the advance allocation of money is not to remain an idle gesture. The new policy must permit of spending the federal-aid money on a different basis than now fixed by law. If the national government is sincere in its desire to accelerate road construction as a measure for relieving unemployment, it will proceed as rapidly as possible to set up such new policy by suitable legislation. But it should be plainly marked, "for the present emergency only."

Much the Same

QUITE like passages from the early history of this country are many of the water experiences of British India, where the outstanding feature is an excess of demand over capacity. Pressure and its corollary, volume, were always in dispute, and often the quality of the water was a subject of controversy. Intermittent supplies, long a fixed policy in some cities of England and still customary in India, have been almost if not quite unknown here, although low pressures resulting from high consumption are not at all unusual. Again, warnings against the danger of contamination entering an empty pipe or one under low pressure have often been sounded; only last spring a master plumber regaled the Indiana section of the American Water Works Association with numerous blackboard sketches illustrating how simple it is for the careless plumber to endanger a public water supply by placing an overflow higher than an inlet or by having a potential siphon from a polluted source to the main supply. The antipathy in India to meters because of cost and prejudice can easily be matched in Chicago. The growth of filtration in India has followed American practice, but has lagged in utilization of rapid filters. The wide rise of chlorination in India is also notable, though chlorination control is undeveloped. It appears, then, that water-supply systems have much in common on whatever side of the globe they are located.

Flood Fighting

COMMON conception of the Mississippi levee as a structure which ceases to be an engineering problem when once it is built is effectually disproved by the article in this issue on engineering devices for levee protection against high water. Primarily, the engineering problem of defending levees against flood is one of organization, but actual defense structures play a vital part. As developed on the river, these structures have as a prime qualification that they can be built quickly of easily available materials. A second property which they possess is that each is specialized to resist a particular form of attack. In combination they provide defense for assaults of all kinds that the floods can assemble in one attack. The important lesson of the article is that the defense must be ready whenever and wherever the attack begins. This requires watchfulness of flood movements and a capacity

of high order to mobilize men, materials and equipment at the place against which the flood forces are flung. Organization is therefore necessary, and it is in their organization for flood fighting that the river engineering forces of the nation and the states along the river display remarkable qualifications.

A New Mississippi

LAST week we referred to the questionable virtue of sending personal and debatable opinions out into the world with the implied sanction of American Engineering Council's approval, because such action suggests that the opinions are backed by the prevailing thought of the country's engineers. The item immediately involved was a project for scrapping the present channel of the Mississippi River and digging a new channel to the Gulf, more than 500 miles long. Needless to say, no such scheme has had consideration by engineers generally. Prof. Gardner S. Williams, its author, chose to make the first presentation of it not before a technical meeting, where it might have been subjected to critical discussion, but before Engineering Council—a most inappropriate place, we think. Appraisal of the scheme, which is outlined in this issue, is left to the reader, who will note both the prodigious size of the undertaking and the lack of any assurance that it would work, as well as the surprising claim that the short, "quick" channel would give two or three times as great a low-water depth as the present long and sluggish one. Apparently there is to be no canalization, and the stability of the new channel is simply taken for granted. Can it be that Professor Williams was not serious in his proposal but advanced it only for an educational purpose? He may have intended nothing more than to emphasize in burlesque exaggeration his opposition to the traditional view—which holds that the Mississippi would become destructively unstable if a single one of its random windings were cut off. The official or Jadwin project for Mississippi flood control having gone by the board through the events of the past year, legislative revision at the next session of Congress is necessary. Perhaps, therefore, the Williams speculation may serve to direct new attention to fundamental elements of the problem.

Cinder Concrete

PROFESSIONAL societies, trade associations and similar organizations have a legitimate function to perform in maintaining a conservative attitude toward new developments and new inventions. But so assiduously is this policy followed that we often have the unusual condition of a process or material in widespread and successful use, exerting a major influence in the art, without benefit of official recognition of any kind. This situation is brought to mind by the recent announcement that a session devoted to cinder and burned clay aggregates is being planned for the annual meeting of the American Concrete Institute in Milwaukee next February. It is almost a revolutionary development; for, if memory serves, cinder concrete has been most carefully ignored officially for at least a decade. In 1924 the joint committee specification covered it only by the indefinite phrase "other approved inert materials," and examination of the A.C.I. *Proceedings* since that date reveals no paper or discussion on the subject, except in connection with concrete blocks. In the meantime, however, cinder concrete has advanced rapidly in use and favor. Few buildings are erected in New York City that do not utilize it for floors and fireproofing. Recently, the designers of a large building proposed cinder concrete for a floor to sustain 250 lb. per square foot live load. Other cities where good boiler house cinders are available are noting their wider adaptation. Burned clay and shale also have a background of successful use as aggregates. It is therefore welcome news that cinder concrete is soon to receive official, if somewhat belated, notice. Restrictions for use, precautions for handling, limits of design may be necessary. But one thing is certain: engineering progress will be thwarted if more temporizing is done. May the papers and discussions that the A.C.I. program committee prepares be instructive and searching in nature.

Beauty and Safety

THE brilliant spectacle presented by the night illumination of a modern city contains few elements as distinctive as the perspective of lights marking out long river bridges. Admirable work has been done by the men who designed and planned the lighting of these bridges in creating esthetic display of high order. It remains to consider in what measure they have succeeded in improving the service of the bridge; that is how effectively bridge lighting facilitates traffic and makes it safe.

As a traffic-carrying agency a long deck highway bridge is merely a section of the road itself, and it will therefore be rated good or bad according as it does or does not give free and safe passage to traffic. If it is to serve night traffic effectively, its roadway must be made clearly visible by lighting, for the bridge roadway differs from a corresponding stretch of open road by being narrow, lacking shoulders, and presenting the special hazards of curb and rail. Moreover, in the darkness it does not give traffic the aid of lateral guidance such as is obtained on the open road from houses, trees or other objects on either side. If the bridge is to be safe for night travel at undiminished speed and without loss of effective width, illumination must bring out the roadway surface and its curb and lane lines in sharp definition, not obscured by gloom or glare.

Most of the existing bridge lighting, when measured by this standard cannot claim a high rating. The equipment usually found consists of lamp globes set on standards of moderate height on either side of the deck. It impresses on the field of view two zones of brightness, or in misty weather zones of diffused glare, and below this brightness an ill-defined obscurity through which, somewhere, the path of travel lies. Whatever illumination is thrown on the surface of the roadway is largely lost, being overpowered by the greater brightness above. If the bridge is straight the rows of lights are measurably useful in roughly marking out the general course of the forward path, but there is none of the exact definition of path which would be provided by clear emphasis of the curb line. Altogether, the night traveler who faces the lights of a bridge is in about the same condition as when driving into a bright sunset—something less than the ideal of safety.

Bridge lighting, like road lighting, is a problem of formidable difficulty. To illuminate the roadway in effective contrast, while keeping the light sources out of the travelers' field of view, is not easy to accomplish within a reasonable cost range. The well-conceived wall-panel system of lighting used in the Holland Tunnel meets these requirements in part, but much of its success depends on the light-reflecting power of the tunnel walls and roof, an assistance not available on bridges;

and even in the tunnel the roadway surface is in relative obscurity. Bridge lighting is not only a more difficult problem than that encountered in the tunnel, but also it is likely to be restricted by closer cost limits. Yet the illuminating engineer's art today commands such varied resources that it may fairly be expected soon to develop means for giving safer and therefore more effective illumination of bridges.

Possibly lighting units recessed in the curb faces or downward-directed projectors set only a few feet above the roadway will offer a solution. Paint striping or other use of color may help to provide the contrast necessary for clear definition. Whether the final practice will use such means or will follow the lines marked out at present remains for the future to determine. But it is encouraging to observe that, as evidenced by an article in this issue, illuminating engineers recognize the limitations of current bridge-lighting practice and are giving studied attention to the problem.

Obviously, the course of the future depends on whether lighting is to be designed primarily for beauty or primarily for traffic safety. The esthetic effects already obtained suggest that beauty is valuable and should not be disregarded, but unless safety is given first place the value of the bridge for its specific purpose of carrying traffic is depreciated. In order to give adequate recognition to the traffic factor it might be well to work out each bridge-lighting problem in two separate divisions, roadway lighting and esthetic lighting, and provide for these two by entirely independent installations which would not affect each other's service. This course would give a definite measure of both results and costs for either purpose, and might lead to more rapid crystallization of views on good bridge-lighting practice.

Common Sense in Dull Times

COMMON sense has as much virtue in dull times as in good. This truth is worth keeping in mind while reading the confusing and generally disturbing news that has made up a large part of the daily record in the last two or three weeks. Much of the news has been interpreted as forecasting bad weather, for the business atmosphere just now is controlled by the pessimists, the bears. Talk about unemployment has suddenly reached a morbid pitch, though during most of the year it was deprecated as improper. Dark forebodings about domestic affairs find encouragement in reports of disturbance and conflict outside the country. Common sense is largely forgotten.

Among the strange ideas that flourish in this state of mind is the belief that a magic cure for the present depression will be found. Very likely faith in the permanence of our seven-year prosperity had become so rooted that much of it survived the collapse of the stock-market inflation a year ago, leading to expectations of a revival as sudden as the collapse. Yet it is a matter of common-sense knowledge that climbing is a slower process than falling, and that ascent to prosperous production can be achieved only by dint of hard work and determination.

One special heresy which contributes to the bearish factors of the moment is a belief, held by a number of influential men, that improvement of business cannot be looked for until wages are deflated. This belief finds no support in present data on wages and employment. It is out of match with the sentiment and temper of the people at large. In fact, some capable observers see a rising wage trend ahead. We may write it down as an axiom that wages will hold, as they have held to date. The bears on wages may conceivably make trouble for the country, especially if they are in control of financial circles, but if so they are quite likely to make trouble also for themselves.

One belief specially affecting the construction field appears among the day's heresies: the belief that increased public-works expenditures can be made to steady the effect of languishing private construction. It is among the things that have tended to slow up private initiative. Even now some faith in this notion can be discerned. Thus, the new promotional commission set up by the President is making its first attack on public works. Again, a Maryland manufacturer evidently believing strongly in the controlling importance of public-works activity, has offered to organize a no-interest loan to his city for use in building public works to absorb the city's unemployment, although municipal credit still rates high in the bond market. And again, there is new talk of increasing road expenditures by anticipating the federal-aid allotments two years ahead. Yet the facts of the past year indicate that it is fallacious to depend on public works as a restorer of good times. Public works have held up to a remarkably high level this year but have not been able to counteract the slackening momentum of private enterprise. Moreover, they have built up a natural resistance; the taxpaying public has shown by repeated votes that it fears a greater tax burden from increased public-works expenditure. Many of the states have not taken up all their federal-aid allotment even for 1930, much less hastened to take advantage of the advance commitment for 1931 made available by Washington; if the advance allocation of 1932 funds is to have any real effect, it seems, the use of federal road money must be liberalized by new legislation.

These facts, fortunately, are coming to general notice. They carry the plain implication that business—production, trade and finance—must do its own uplifting and cannot be raised out of the morass by the leverage of public works. Still less can it be raised up by unproductive work, charity work such as is projected by some financial philanthropists to give unemployed men a disguised dole.

That the courage derived from energetic initiative based on common-sense foresight is the only means of progress has been recognized in a practical way by a good many. Some of our great industries, for example, have been busy since last winter in carrying out expansion and development programs of large magnitude, taking advantage of the year's low costs and favorable working conditions. They saw the logic of the situation and set to work. Over-production is not likely to be a scare-word to those who have so prepared, for with high producing efficiency they will dominate their field and eliminate the competition of their neighbors' higher-cost plants. And this, after all, is the true cure for over-production.

Present experiences thus not only exhibit the need for common sense applied to the conditions of dull times, but in many examples demonstrate its success. If the outlook is appraised soberly and sensibly it gives warrant for much healthier optimism than is reflected in current talk about unemployment and wholesale relief, or in attempts to cure the trouble by "drives." If similar sober sense is put into practice by each one, according to his lights and his powers, in carrying forward his own work, normal production will soon be restored.

Public Water Supplies in British India

Outstanding Feature Is That the Demand of Consumers Greatly Exceeds the Supply, Necessitating the Adoption of Operating Expedients — Works at Bombay, Rangoon and Calcutta

By Harold E. Babbitt
Professor of Sanitary Engineering, University of Illinois, Urbana, Ill.

A General Picture of public water supplies in British India, with references to half a dozen specific works to illustrate points being made, is followed by some interesting details of the water-works of Bombay, Rangoon and Calcutta. The notes on which the article is based were taken by Professor Babbitt during a recent visit to India. Earlier articles by Professor Babbitt resulting from his recently completed trip around the world were: "Sanitation in China," March 20, 1930, p. 484; "Water Supply and Sewerage of Large Japanese Cities," May 1, 1930, p. 729; "Engineering Conditions in Hawaii," June 12, 1930, p. 976; "Progress in Control of the Nile for Irrigation," Aug. 7, 1930, p. 206. —Editor.

THE principal lesson to be learned from the water-works of British India is the management of a plant which is inadequate to supply the amount of water demanded by the consumers. Not one of the water-works visited in India had sufficient capacity to supply the demand. The expedients adopted under these circumstances include an intermittent supply, low pressures and the use of "no-waste" faucets on street hydrants. Meters are not commonly used on the services to small consumers because of their cost and the prejudice of the people against them.

Supplying water for less than 24 hours per day is an inefficient way of diminishing consumption and creates evils not always anticipated. Waste is increased so greatly by an intermittent supply that the consumption of water may be greater than when it is supplied continuously. When water is supplied during less than 24 hours per day and the supply is not metered, it becomes the custom of the consumers, during the period of non-supply, to place receptacles under the faucets, which are opened. When the supply is turned on, the receptacles are filled but the unattended faucets continue to discharge water to waste. The entire amount of water in the receptacles will probably not be used. It is the custom to dump this water to waste just before the time for the coming of a new supply. In Lucknow, one of the few cities of its size enjoying a 24-hour supply, it is claimed that the consumption of water is now less than when it was supplied intermittently.

Danger of Pollution—An evil which usually accompanies an intermittent supply or the use of very low pressures is the danger of pollution of the water. The reduced pressure or the absence of water in the mains will permit the entrance of sewage or polluted water through leaks, and emptying the mains creates suction which may draw polluted water through leaky joints or through open faucets or valves submerged in plumbing fixtures or other receptacles. It has been found that even where water mains are always under some positive pressure suction may be created in a service pipe due to a high velocity of water in the main, the action being similar to that in a jet pump. Many of these points are emphasized and illustrated in a report, issued in May, 1929, by the filtered water contamination special committee of the Calcutta municipal council. The danger from the jet pump action in the water mains is brought out in this report by the statements credited to the local government board of England: "The liability of leaky water pipes to act as land drains to receive foul matters as well as land drainage through their leaks is not to be overlooked. Such leaky pipes running full of water with considerable velocity are liable to receive by lateral in-suction at their points of leakage external matters that may be dangerous. The latter fact is not recognized so generally as it should be, and ignorance of it has probably baffled many inquiries in cases where water services have in truth been means of spreading disease."

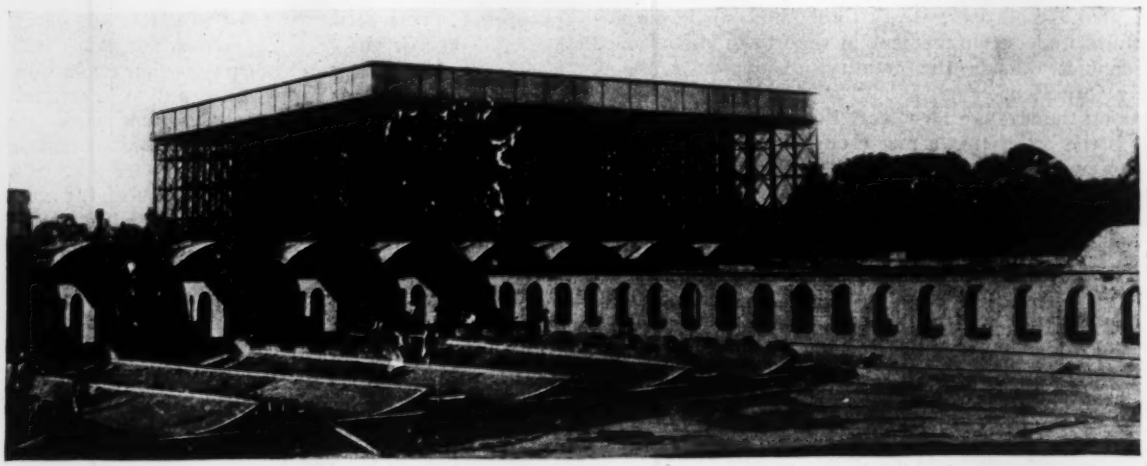

FIG. 1—ELEVATED RESERVOIR AT TALLAH FOR THE CALCUTTA WATER-WORKS
This reservoir is 320 ft. square and has a capacity of 11,250,000 gal. It is 16 ft. deep and the distance from the ground to the bottom of the tank is 110 ft. In the foreground are covered reservoirs.

FIG. 2—TYPICAL GROUP AT A WATER HYDRANT IN AN INDIAN CITY

Waste of Water—In most Indian cities water is supplied to the poor through street hydrants. A typical scene around one of these hydrants is illustrated in Fig. 2. If an ordinary faucet is placed on such a hydrant it is certain to be left open to run continuously, the first user enjoying a bath, the waste from his bath serving to wash a family's clothes, and the puddle thus created offering a delightful wallow for an overheated water buffalo. An attempt to prevent this abuse by the use of spring valves which must be held open during discharge of water will not always be successful. The handle may be wired down or a block placed on the valve seat to hold the valve open. Such abuses can be reduced, as in Calcutta, by the employment of special police who patrol the city, and can be minimized by the use of a "no-waste" valve which will deliver only a limited quantity of water when the valve handle is held open.

A common difficulty met in water-works operation in India is waste due to carelessness and ignorance. The habit of leaving faucets open is so widespread in Calcutta that attempts to create a high pressure in the mains have been unsuccessful with the existing pumping equipment. It is thought that if a high pressure could be held continuously for a relatively short time a number of open faucets would soon be closed by the consumers so that the pumping effort to maintain the pressure would diminish and that ultimately all continuously open supplies could be closed. Under such conditions the existing pumping equipment might be sufficient to maintain a continuous supply. Published appeals to the people and other expedients have been unsuccessful in securing co-operation. Ignorance, indifference, and antagonism are not conducive to public co-operation with governmental bureaus. The personal habits of the population and the high temperatures are conducive to frequent bathing, and religious considerations generally demand that the bath be taken in running water.

These habits are a partial cause of the large demand for water in many Indian communities. The rate of water consumption per capita in most cities cannot be stated with accuracy, because of inadequate population data, the existence of private water supplies and the lack of knowledge of the number of consumers drawing water from the unmetered street hydrants. The highest rate of consumption is probably to be found in Calcutta, where the total consumption is probably greater than 175 gal. per capita per day and would be more if the water were available. In Lucknow, where water is supplied continuously, the rate is reported as 38 gal. per capita per day. At Delhi, where water is supplied for twenty hours per day and all services are metered, the rate of consumption per capita per day is the same as in Lucknow, and in Jaipur less than 2,000,000 gal. (2 m.g.d.) are pumped daily to a population of 124,000.

Most Water Supplies Municipally Owned—Municipally owned public water supplies exist in practically all cities. Mandalay was the only city visited which had no water-distribution system, dependence being placed on shallow wells scattered throughout the city. One of these wells is shown in Fig. 3. Surface supplies are most common. Many of the larger cities of middle and northern India are situated on rivers large enough to supply all demands. Lahore, situated on the Ravi River, takes its supply from wells located in an ancient channel of the river. Because of the inadequacy of the well supply plans have been completed to take water from the river and to filter it before distribution to the city. Groundwater supplies are to be found principally in the smaller cities. Sewer systems are to be found in nearly all cities, but no sewage treatment, the sewage being discharged directly into the rivers. A few sewage farms exist for the purpose of irrigation but not for sewage treatment. The pollution of the river water has necessitated the construction of filter plants in all cities using river-water supplies. The Rangoon and Bombay water supplies are outstanding examples of unfiltered surface supplies. The water for these cities is collected, however, on sparsely inhabited watersheds, the quality of the water being such that protection is given to the public health by chlorination.

Filters—Slow sand filters are widely used and stand in high favor. Under the conditions in India it is probable that slow sand filters are safer than rapid sand filters because of the more foolproof characteristics of the former and the difficulty of obtaining reliable and well-trained operators for the latter. Where rapid sand filters are used, those of the Paterson type (British) are most common. It was interesting to note that at Delhi the slow sand filters had been abandoned in favor of rapid sand filters, and at Agra a rapid sand-filter unit has just been completed to supplement the older slow sand plant. At Cawnpore the water for the slow sand filters is prefiltered through Puech Chabal (multiple) filters (Fig. 4).

Practically all filter plants are worked to the limit of the capacity of the filters without reserve and in an empirical manner without close laboratory supervision. No water-works visited possessed a laboratory for water analysis. A difficulty common to all filter plants is due to algal growths in settling basins and filters, as but few are covered. The situation is worst in April and May during the hottest part of the dry season just preceding the monsoon. At no place visited was the quality of the water seriously affected by algal growths, but the amount

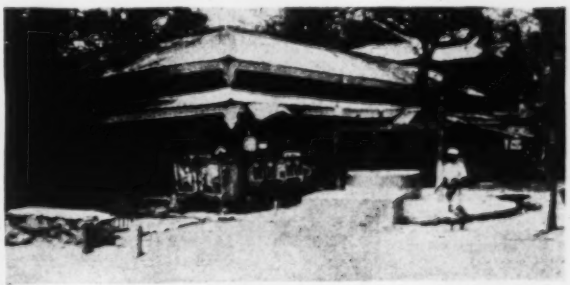

FIG. 3—PUBLIC WELLS IN MANDALAY
The city has no water-works system.

of labor required to keep the filters in operation was increased and the length of filter runs was shortened. Although all surface supplies are chlorinated, there was only one water-works visited in which a test for residual chlorine is made by the water-works department. At one city a mixture of groundwater and an inadequately filtered, polluted surface water was being delivered to the consumers without chlorination, the chlorine equipment having been out of order for some time.

Laboratory control of the quality of public water supplies is secured through periodic analyses by provincial laboratories. The strength of the chlorine dose is recommended by the laboratory, but days or weeks may elapse between the collection of the sample and the receipt of the laboratory report by the water-works superintendent. Since filter plants are generally operated to the safe limit of their capacities, fine points in the economics of operation need not be considered. This condition and the lack of close laboratory supervision of filter operation and chlorination may partly explain the rise of water-borne diseases during the rainy season.

It would be incorrect to attribute all water-borne

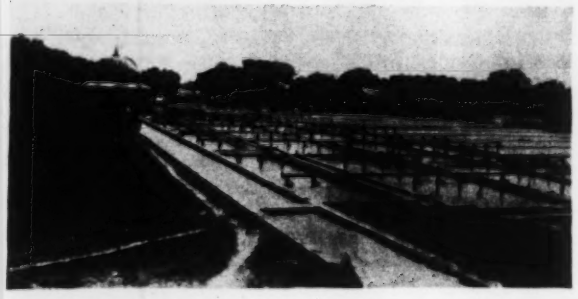

FIG. 4—PUECH CHABAL FILTERS, EQUIPPED FOR BACKWASHING WITH AIR, AT CAWNPORE

diseases to improperly operated public water supplies, because the habits of the people are conducive to the contraction of water-borne disease through other sources than the public water supply. An outstanding example of this situation is to be found at Benares, the holy city of the Hindus. The water of the Ganges River, which flows by Benares, has a high religious potency to such an extent that it is bathed in, it is used for cleaning teeth, human corpses are dipped in it, sewage is discharged into it, animals long dead are dumped in it, and it is consumed as a beverage—all in the same locality at the same time. The sights along the bathing ghats (Fig. 5) and burning ghats at Benares are a strong argument against the danger from water-borne diseases, as countless hordes of people from all over India drink this water without apparent ill effect. The ratio of those exposed to water-borne disease compared with those who contract a disease at Benares must be very small.

Bombay Works—The water supplies of Bombay and

TABLE I—IMPOUNDING RESERVOIRS FOR BOMBAY WATER SUPPLY

Name of Reservoir	Date of Completion	Storage Capacity, Million Gallons	Area of Watershed, Sq.Mi.	The Dam — Length, Ft.	The Dam — Max. Height, Ft.	The Dam — Material
Vehar	1860	9,120	4	1,130*	85	Earth
Tulsi	1879	2,294	2.7	1,350	85	Masonry
Tansa	1915†	35,600	53	9,800	135	Masonry
Powai	1921	1,200	2.7	650	30	Masonry

*There are two other smaller earth dams.
†The lower part of the dam was constructed in 1892. The dam has been raised twice since then, the last raising being in 1915, when the top was left at El. 414.58 above Bombay datum.

FIG. 5—BATHING GHATS ON THE GANGES AT BENARES

Rangoon are similar in that both are secured from impounding reservoirs located in the hills at some distance from the city. Data concerning the four impounding reservoirs in Bombay are given in Table I. Water is now taken only from the Tansa and Vehar reservoirs, through aqueducts and pipe lines, to Bombay. Here it is discharged into distributing reservoirs, from which it is distributed by gravity to all parts of the city except to a few hill sections, which are supplied through small booster pumping stations. The principal supply for the city is taken from the Tansa reservoir. The amount of water taken per day from this reservoir has been progressively increased, the latest work being the construction of an aqueduct consisting of two 72-in. steel pipes 55 miles long with a capacity of 90 m.g.d. (Fig. 6). The construction of this aqueduct was completed in 1927 at a cost of 268 lakhs of rupees (about $10,000,000). The reservoir is not capable of supplying water at the rate of 90 m.g.d. during a series of dry years. During the rainy season of 1929 the level of the water in the reservoir rose only to within 8 ft. of the dam spillway, so that the supply for the latter part of 1930 is dependent upon a rainfall during this year's monsoon above the average. Chlorine is added to the water in the aqueduct at a point about 30 miles below the Tansa dam. It is added at the rate of between 0.2 and 0.5 p.p.m., which amount has always been sufficient to prevent the presence of B. coli in 100 c.c. of the water. Two chlorinating plants more than a mile apart are installed to assure the safety of the quality of the water supply.

The water from Vehar Lake is conveyed to Bombay through a single cast-iron pipe line varying in size from 32 to 48 in. The water from Tansa and Vehar reservoirs is conveyed by gravity to storage and distributing reservoirs in the city. There are two reservoirs on Malabar Hill, the highest in the city. One has a capacity of 22½ m.g. and the other 14 m.g., and there are two reservoirs forming a part of the Bhandarwada works, each with a capacity of 9½ m.g. Water from these reservoirs is distributed to the city by gravity, except for some small booster pumps used on some of the higher districts. The distribution system has been separated into districts, and water is supplied to each district during a limited number of hours per day, after which it is turned into the pipes of another district. To avoid some of the evils accompanying an intermittent supply, sufficient water is sent continuously to all districts to keep the pipes filled with water. The rate of water consumption is now about 62 gal. per capita per day, as shown in Table II.

The Tulsi and Powai works include rapid sand-filter plants with a capacity of 5 and 3½ m.g.d. respectively. These filters are of the Paterson type, and the plants are

equipped for the chlorination of the filtered water. The filtered water can be discharged into any one of the distributing reservoirs through conduits and pipe lines. The water in these two lakes is not ordinarily used, being held as an emergency supply.

Rangoon's Water Supply—The water supply of Rangoon is collected in Hlawaga Lake, an impounding reservoir formed by the construction of nine dams. The watershed, with an area of about 10 square miles, is uninhabited and is well policed to keep off trespassers. The water flows by gravity from the reservoir, through a 42-in. pipe (material unknown to writer) for 2½ miles to a booster pumping station, from which it is pumped 6½ miles to the main pumping station at Yagoo, which is at the lowest point in the pipe line and is 8 miles from the city. The Yagoo pumping station lifts the water to a 25-m.g. distributing and storage reservoir on a hilltop in the city. The water is chlorinated as it leaves Hlawaga Lake. The amount of chlorine to be added is determined by the health department. It is said that owing to the lack of filtration the quality of the water during the rainy season is none too good. The rainfall in Rangoon, as in the greater part of India, is concentrated in the months from May or June to September or October. The annual rainfall on the Hlawaga watershed is between 90 and 100 in., and during some days as much as 6 in. may fall.

The demand for water in Rangoon exceeds the supply, so that the pressure is reduced in the distributing mains during the day. At present about 12.5 m.g.d. are supplied from the reservoir and 3 to 4 m.g.d. from wells. In the design of extensions to the water-works it is assumed that 30 m.g.d. would be consumed if the supply were available. There are about 400,000 people in Rangoon, of whom only 250,000 are dependent on the public water supply. The others obtain their water from wells.

Conditions in Calcutta—Calcutta takes its water at two different points from the Hoogly River, on the banks of which it is situated. The water which is to be filtered is drawn from the river at Pulta, about 12 miles above the city, at a point free from gross pollution and free from brackish water except for a few hours during extremely high tides. The raw water is passed through settling basins and slow sand filters and is then pumped through three cast-iron pipes, two of 48-in. and one of 42-in. diameter, to the Tallah distribution pumping station at the northern boundary of the city. A number of underground storage tanks, with a total capacity of about 10 m.g., are located here. The Tallah elevated reservoir, which is connected to the distribution system, is one of the world's unique water-works structures. This reservoir, or elevated tank (Fig. 1), which was built in 1911, has a capacity of 11.25 m.g. It is 320 ft. square in plan and is 16 ft. deep. The distance from the ground to the bottom of the tank is 110 ft., and the total weight of steel in the tank and supports is 4,480 tons. The distribution system is divided into five zones, each with a direct main to the pumping station. Before the distribution system was zoned it was often impossible to create pressure in remote parts of the city because of continuously open services throughout the system. The supply of filtered water is maintained only during a few hours daily, but an attempt is made to keep the distributing pipes full of water at all times.

A supplementary supply of unfiltered water, polluted and brackish, is pumped from the Hoogly River opposite the city. This water is used only for flushing, cleaning and fire protection. Buildings are provided with plumbing for both water supplies. Cross-connections between the two systems are avoided by restricting plumbing work to licensed plumbers, who are informed of the prohibition against and the danger from cross-connections, and by building inspectors, who certify to the legality of new work. About 87 m.g. of unfiltered water and 73 m.g. of filtered water are pumped per day.

An interesting report on the contamination of the filtered water supply of Calcutta was published in May,

FIG. 6—THE NEW TANSA AQUEDUCT, BOMBAY
This consists of two 72-in. steel pipes crossing under the old masonry aqueduct.

1929, by a special committee of the municipal council. The report brings to light many inherent defects in the system, most of which can be attributed to the intermittent operation of the pumps. The committee states: "The intermittent system carries many evils in its train. When the supply is turned off, water flows to the lowest level of the city and vacuum is produced in the water pipes in the higher levels, and, if there is the slightest leak in any pipe joint or any other fitting, it will suck in anything that surrounds the pipes—filthy liquid or obnoxious gases." Contamination has resulted, principally from the existence of: (1) surcharged and blocked sewers, resulting in the saturation with sewage of the soil surrounding water pipes; (2) water pipes laid beneath, through and inside of sewers; and (3) suction created in the water pipes under conditions of general low pressure or of local high velocities in the distributing mains.

Improvements in Progress—The general inadequacy of the capacities of water-works in Indian cities is due to a lack of funds for public works rather than a lack of appreciation of the advantages of a plentiful supply of

TABLE II—GROWTH OF THE BOMBAY WATER-WORKS

	1861	1872	1879	1881	1886	1891	1892	1901	1911	1916	1921	1926
Population in thousands	700	644	745	773	800	822	830	776	979	1,000	1,176	1,274
Number of connections	1,061	10,037	12,036	12,817	14,448	17,634	18,113	20,552	27,314	25,542	27,305	31,868
Number of properties	16,902	22,020	23,693	24,034	31,369	33,445	33,557	34,900	40,864	45,716	48,670	46,138
Supply, million gal. per day	9	9	13	13	17.5	17.5	39.5	39.5	42*	57.5	50.5†	79
Gal. per capita per day	12½	13½	17½	17	22	21½	47½	50½	42½	57½	43	62
Annual income, thousands of rupees‡	45.6	407.8	351.8	524.8	774.6	1,181	1,407	1,547	2,089	2,472	3,331	7,208

*Increased supply due to enlargement of the northern portion of the Vehar main from 32 to 48 in. between 1909 and 1914.
†Restricted supply on account of deficient rainfall.
‡One rupee is about 37c. American money.

water. Almost all large water-works have been enlarged or improved in the past five years, and many plans for further extension are in preparation or have been completed. In Calcutta an extension to the water-works is in progress. It includes additional settling basins, new filters, new pumping equipment, an additional conduit from Pulta to Tallah and a rearrangement of the distribution system, all to be completed in 1930 at a cost of $10,000,000. In Bombay the Tansa "completion works" were opened in December, 1927. This work involved the construction of an aqueduct 55 miles long consisting of two 72-in. riveted steel pipes and appurtenances, costing about $10,000,000. The renovation and extension of the water-works at Benares was marked by the starting of the new electrically driven centrifugal pumps in May, 1930. Approximately $300,000 was spent on this work. The additions to the water-works at Agra were to be complete in May or June, 1930, when the new rapid sand-filter unit was to be put into service. The cost of this work has been about $100,000. The plans for the changes of the water-works at Lahore show an estimated cost of $2,250,000. A list of the cities completing or contemplating extensions and improvements to their water-works would be long. It is, however, indicative of activity and interest in water-works and an appreciation of the value of a good water supply.

Some General Notes on the Lighting of Bridges

Such Spacing and Size of Lights Should Be Adopted That Uniform Illumination Will Result Along Center Line of Bridge

By Marcus S. Gilbert
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IN DESIGNING bridge-lighting installations, the roadway should be given the most attention, since it has the closest contact with both vehicular and pedestrian traffic. The fundamental problem is not different from the lighting of any city street, for which the requirement is sufficient light of the correct quality in the proper place.

In studying illumination, each ray of light is resolved into vertical and horizontal components. The horizontal plane, or the surface of the roadway, is illuminated by the vertical components of all light rays emanating from the lighting units, while the vertical planes, such as license plates of automobiles are illuminated by the horizontal components of the light rays. Usually, if the illumination from the vertical components is adequate, the light from the horizontal components will also be satisfactory.

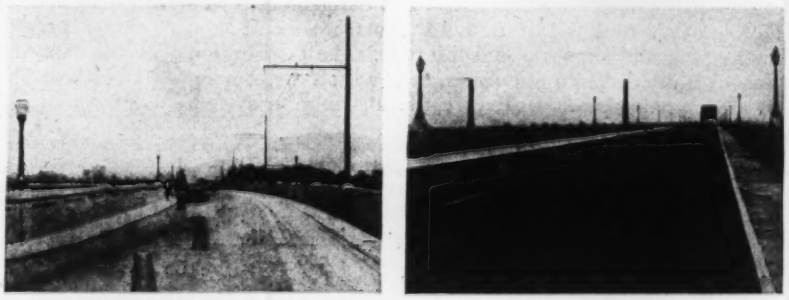
Quality of road illumination depends, to a certain extent, upon quantity. Good visibility can best be obtained with the least possible variation between maximum and minimum horizontal foot-candle values measured on the roadway. In other words, when the uniformity factor, or ratio of minimum to maximum foot-candles, is unity, the illumination is ideal, provided there is a sufficient quantity. At the present stage of the art it is impossible to secure a uniformity factor of 1 over the entire roadway; therefore, the designer must be content with 100 per cent uniformity along the center line of the roadway only. With such uniformity of illumination it is possible for a rapidly moving motor vehicle to pass along the center line or very close to it without the necessity of the driver's eyes becoming accustomed to alternately bright and dark patches of roadway. Uniformity of illumination along other longitudinal lines, such as sidewalks, and along transverse lines of the roadway, is not so important because the traffic along such lines is usually slow and there is more time for eyes to become accustomed to variations in illumination. Another factor to be considered is glare, and care should be taken to reduce it as much as possible by the elimination of non-reflecting surfaces.

TABLE I—RECOMMENDED INTENSITIES FOR BRIDGE LIGHTING

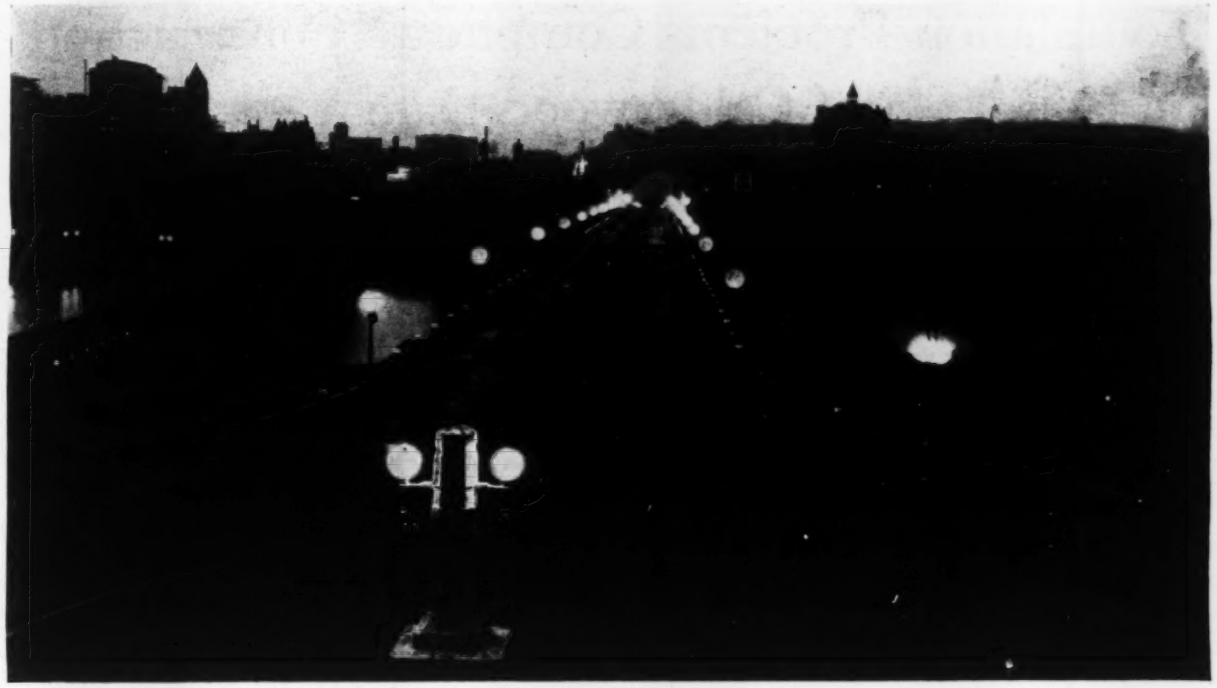
Location of Bridge	Mounting Height, Ft.	Spacing of Units, Ft.	Lumens per Standard	Lamps Per Average Standard No. and Candlepower	Horizontal Foot-Candles	Uniformity Factor
Main traffic street	15 to 17	90 to 140	6,000 to 20,000	1—600 to 2—1,000	0.5 to 1.0	0.70
Minor traffic street	14 to 16	90 to 140	6,000 to 10,000	1—600 to 1—1,000	0.25 to 0.35	0.60
Highways	18 to 25	90 to 140	2,500	1—250	0.15 to 0.25	0.50

In order to secure good illumination along the roadway, it is necessary to mount the lighting units properly and to select lamps of proper size. If 0.4 foot-candle is obtained when 6,000 lumen lamps are used, 0.66 foot-candle will be obtained if the lamp size is increased to 10,000 lumens, assuming that all other factors remain unchanged. If the distance between units is shortened the illumination is increased, while if the mounting height is raised the uniformity factor is increased. If the units are supplied with properly designed refractors, a greater spacing is possible than when no refractors are used. It is impossible to predict the exact illumination to be obtained from a given installation unless a careful study is made of the luminous flux distribution of the lighting unit selected. Since such a study would require considerable time, even if one were thoroughly familiar with lighting practice, the accompanying table of recommendations is presented to cover in a general way the application of lighting to bridges.

Energy Distribution—Before proceeding with the selection and installation of the necessary equipment, it is advisable to give some attention to the energy requirements of the lamps. There are two main systems of



BRIDGE-LIGHTING STANDARDS ON WIDELY SEPARATED STRUCTURES
Left, International Bridge between El Paso and Juarez, Mexico. Right, Peace Bridge connecting the United States with Canada at Buffalo.



EFFECTIVE ILLUMINATION ON LIBERTY BRIDGE, PITTSBURGH, PA.

energy distribution used in street lighting—namely, the series and the multiple. The type of lamp used depends upon the system.

The three main types of series systems and their distinguishing features are as follows:

1. The straight-series system, which usually operates at 6.6 amp. and consists of a continuous conductor that connects all the lamps in series with the secondary coil of a constant-current regulating transformer.

2. The series system with safety coils, in which a conductor connects the primary windings of a number of safety coils (current transformers) in series with the secondary winding of the regulator, and a lamp is connected across the secondary winding of each safety coil.

3. The group-series system, in which the lighting units are divided into groups of 3 or 5 kva., the lamps of each group being connected in series with the secondary winding of a 3- or 5-kva. current transformer, while the primary winding of each transformer is connected, also in series, with the secondary winding of the regulator.

By the use of a 20-amp. straight-series system instead of the 6.6-amp. system, the line voltage can be reduced to a third of its value and the advantages of 20-amp. lamps (ability to withstand shocks, tendency of filament not to sag, higher efficiency than 6.6-amp. lamps) would be applied to the benefit of the system.

In the case of multiple systems, the 230-115-volt three-wire grounded neutral system is the most frequently employed because it limits the line losses to minimum values.

Lighting Equipment—A wide choice of lighting units is available, and these should be selected to harmonize in design with the bridge architecture. Upright lighting units of the same type as used in ornamental lighting installations along thoroughfares may be used on most bridges and especially on deck structures. Single or duplex lighting standards should be installed, preferably on the sidewalk far enough from the curb to allow clearance for automobiles. They may also be installed on the balustrades. In the case of through bridges, brackets supporting either upright or pendant units may be more conveniently used. In no cases are cluster lighting standards recommended.

Selection and provision for cables and transformers is the next step. On all large bridges, especially those that cross state or international boundaries, it is good insurance to have the energy supplied from both sides. The best arrangement is for alternate lighting standards to be supplied from one end of the bridge, with the remaining standards energized from the opposite end of the structure.

If safety coils or current transformers are required, one is located in the base of each lighting standard, or near each lamp in case overhead wiring systems are used. The size of the constant-current regulators wil be determined by the number and size of lamps each serves. The cable between the regulator and the primaries of the current transformers, or between the regulator and the lamps, as the case may be, should be insulated for the open circuit voltage of the regulator. When it runs under the bridge, it should be rubber-covered, lead-incased and steel-taped, unless conduit is used. In the latter case, steel-taped cable should also be used on the secondary side of the group-series current transformer when there are no conduits, but should be insulated only for the open circuit voltage of the current transformer. As a general rule, No. 8 conductors should be used for all 6.6-amp. series circuits, except when the circuits are overhead, when No. 6 conductors are recommended. To carry energy from the secondary side of an individual safety coil to the lamp, No. 10, 600-volt, rubber-covered, double-braided wire should be used. Because there would be high inductive losses if steel-taped cable were used, No. 6 non-inductive cable is recommended for all 20-amp. series circuits.

Foundation Problems Complicate Construction of Calderwood Dam

Fault in Rock Under East Abutment Tunneled Out Underneath Abutment Concreting Operations and Afterwards Concreted Through Pipes Left in Abutment Concrete—Center Drifting and Ring-Blasting Methods on Penstock Tunnels—Surge Tank Shaft in Rock

PREVIOUS articles on the Calderwood hydro-electric development of the Aluminum Company of America have described the dam design (*Engineering News-Record*, Dec. 19, 1929, p. 954) and the use of unusually dry concrete compacted by mechanical tamping (*Engineering News-Record*, Oct. 24, 1929, p. 640). This article describes the general construction procedure, more particularly in preparing the dam foundations and in driving the large section penstock tunnel through solid rock.

THE CALDERWOOD hydro-electric development is located on a 180-deg. bend of the Little Tennessee River, as shown in Fig. 1. It consists of a thin-section-arch overflow dam 230 ft. high, a gravity dam 40 ft. high to form a cushion pool to receive the overflow from the main dam, a 26-ft. pressure tunnel 2,400 ft. long cutting across the river bend, an 18-ft. surge shaft rising on a 51-deg. slope from the lower end of the tunnel and ending in a surge chamber 83x30x45 ft., all dug out of solid rock, and a power house containing three 56,000-hp. turbines operating under a 213-ft. static head.

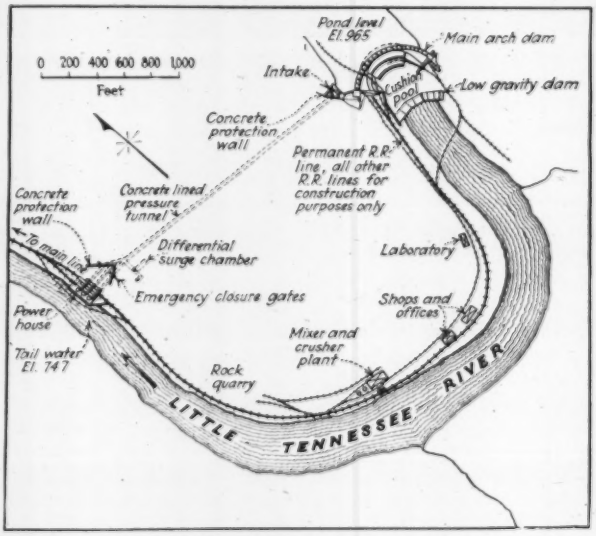


FIG. 1—MAP OF CALDERWOOD HYDRO-ELECTRIC DEVELOPMENT

In constructing the dam over 300,000 cu.yd. of overburden were sluiced off the site of the right abutment, revealing a smooth tight ledge sloping upward from the river bed at an angle of 53 deg. with the horizontal. Stepping-off this ledge provided an ideal foundation for the abutment. On the opposite side of the river a deep narrow fault was found to exist beyond an apparently solid ledge. This fault was entirely cleaned out by tunneling methods in cramped quarters and filled with concrete. Driving and lining a 2,400-ft. pressure tunnel, larger than a standard double-track railroad tunnel, and a steeply inclined surge shaft; building concrete protection walls on a steep mountain side to deflect rolling stones and slides away from the power house; and the operation of a completely equipped quarry and crushing plant for the manufacture of all coarse and fine concrete aggregates were other interesting construction features.

The left side of the canyon at the site of the arch dam is very steep, with rock outcroppings. Preparing the foundation for the left abutment required moving but little overburden and loose rock, but investigation showed that a narrow vertical fault existed, running parallel with the arch thrust. To have excavated all material between this fault and the stream would have meant removing a large amount of solid rock which would have had to be replaced with concrete. To have cleaned out the fault from the top would have delayed the construction of this end of the dam. Therefore, it was decided to remove the loose material in the fault by tunneling and then fill the cavity with concrete. To do this without delaying construction the abutment was concreted over the fault, and 18-in. vertical pipes on 20-ft. centers were provided for concreting the fault after it had been excavated.

An adit just large enough to accommodate a man with a wheelbarrow was driven at right angles to the fault from a short distance downstream from the abutment. The adit floor was at El. 820, or 160 ft. below the top of the abutment. A 7x10-ft. shaft was raised at the intersection of the adit and fault, the shaft striking the surface at El. 960, and from this drift the entire fault above the tunnel was cleaned out. All excavated material was removed through the adit in wheelbarrows. Directly under the abutment which had meanwhile been concreted, a 7x10-ft. shaft was sunk from the drift to El. 760, and four grout holes 50 ft. deep were drilled in the bottom of the shaft. This shaft was excavated by hand-loading into wheelbarrows, which were hoisted in slings to the drift-tunnel floor by a small air hoist.

To prepare the foundation under the dam arch a rock-filled timber-crib cofferdam was built out into the stream from the right bank, and steam shovels excavated the riverbed to solid ledge (Fig. 2). The foundation blocks for the right half of the dam were then poured, leaving two 15x20-ft. sluiceways to carry the river diversion later on. Another crib cofferdam was then built on the left side of the dam, and the foundations completed, leaving two more sluiceways for river diversion. When the dam was completed these diversion sluiceways were closed by sliding steel gates on the upstream side; the gates were built of I-beams welded flange to flange. These gates withstood a 200-ft. head without leakage while the sluiceways were being plugged with concrete.

A heavy overburden existed on the site of the right abutment, overlying a tight smooth ledge (Fig. 3) sloping steeply upwards in a plane parallel to the stream.

FIG. 2—EXCAVATING FOUNDATIONS UNDER MAIN ARCH DAM

block was about 46 ft. long at the downstream crest arc. The joints between the blocks were provided with sheet-iron grout stops at both upstream and downstream ends, and after completion they were grouted under heavy pressure (starting at 110 lb.) through pipes sealed into the tops of triangular vertical grooves left in the faces of the joints.

All concrete was handled by steel guy derricks, as many as eleven being used at once, all operated by compressed air. The derricks had 110-ft. masts and 100-ft. booms and were each set up with eight guy cables, some of the guys being over 2,000 ft. long. The concrete was poured in 10-ft. lifts; it came to the dam in 4-yd. buckets on flat cars.

As explained in a previous article (*Engineering News-Record*, Oct. 24, 1929, p. 640), the concrete was mixed extremely dry and tamped into place by electric vibrating machines. Special straight-side, 4-yd., bottom-dump buck-

FIG. 3—HYDRAULIC GIANTS SLUICING OVERBURDEN OFF SLOPING ROCK LEDGE, RIGHT ABUTMENT

This mixture of soil, gravel and boulders, amounting to over 300,000 cu.yd., was removed up to a point high above the top of the dam and over the intake site by two hydraulic giants. The material was washed to the foot of the slope against a cofferdam and removed by steam shovels. Stepping-off the sloping ledge (Fig. 4) provided an ideal abutment foundation.

Diamond-drill grout holes were driven in all directions under the abutment sites to close up any existing seams in the rock. Grout was forced into these holes at pressures ranging from 400 to 600 lb. per square inch by air-operated two-cylinder piston pumps. No rock was displaced by these high pressures. The upstream side of the main dam foundation site was also fully grouted. Drains were placed in the downstream side of the foundations to take care of any possible water getting through the grout curtain.

For construction purposes the dam was divided into seventeen radial blocks, exclusive of the abutments; each

FIG. 4—STEPS IN SLOPING LEDGE FOR FOUNDATIONS OF RIGHT ABUTMENT

ets were required to handle the dry mix, as it was found impossible to dump the stiff concrete from the usual type buckets with flaring sides. At the end of each day's pour a 2x6-in. wooden water stop was placed across the block near the upstream edge. Instead of the usual keyways for bonding purposes, the surface of the concrete was left in the form of a ridge at the end of each pour.

Pressure Tunnel and Penstock Construction

For the first 219 ft. from the intake the pressure tunnel is a 26½-ft. circle inside a 12-in. concrete lining. This circular section is level for the first 131 ft.; the remaining 88 ft. slopes downward at an angle of 51 deg. with the horizontal. Rings of ten grout holes, 20 ft. deep, were drilled on 25-ft. centers along this circular section. For the next 1,727½ ft. the pressure tunnel is on a 2 per cent downgrade and consists of a section 26 ft. wide, with 11-ft. vertical sidewalls and a semicircular crown of 13-ft. radius, all inside a minimum 12-in. concrete lining, including the invert. In the last 400 ft. the tunnel branches out to accommodate three 16-ft. steel penstocks, all sloping steeply downward.

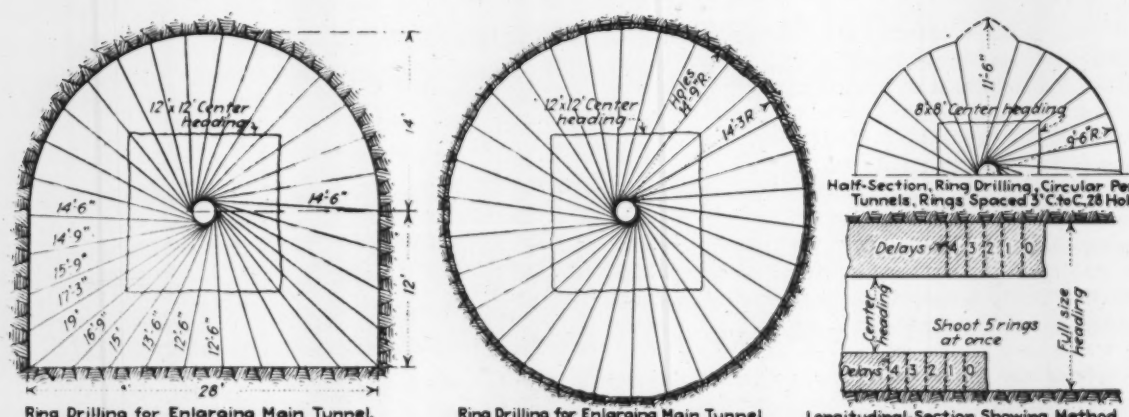
The entire tunnel was driven from an adit at the lower end, intercepting No. 3 penstock at the main tunnel level above the penstock drop. A 12x12-ft. center heading was driven the full length of the tunnel before starting the enlargement. In driving the heading, 25 holes were drilled, pulling 8 ft. at a shot. Muck was handled by an electrically operated mucking machine loading into 2-ft. gage cars handled by storage-battery locomotives.

Enlarging the heading to full section was done by radial ring-drilling 32 holes on the arch section and 30 holes on the circular section from a longitudinal crossbar carried by two vertical posts, each riding on a set of trucks. The holes varied in length from 12½ to 19 ft., as shown in Fig. 5. Drilling was kept far enough ahead of the blasting and mucking to cause no interference. Five rings were loaded and shot at a time, using the delays shown in Fig. 5. To facilitate mucking, the shooting was so arranged as to keep the lower half of the full heading three rings ahead of the upper half. Standard-gage, 6-yd. cars hauled by gasoline-electric locomotives removed the muck. A 1¼-cu.yd., air-operated shovel loaded the cars. All muck on both the center-heading driving and the enlargement was hauled out through the adit and to the rock-crushing plant to be made into concrete aggregate.

FIG. 6—TUNNEL AT THE PENSTOCK MANIFOLD LOOKING TOWARD POWER HOUSE

FIG. 7—PRESSURE TUNNEL AFTER LINING
Tunnel is 24 ft. high and 26 ft. wide, inside of lining.

An 8x8-ft. center heading was used for the penstock tunnels, working from the portals, and the enlarging was done by ring-drilling 28 holes, the rings being spaced 3 ft. on centers. Sections of the 16-ft. penstocks weighing 17 tons each, were skidded into place



Ring Drilling for Enlarging Main Tunnel, Arch Section, Rings Spaced 3½ C. to C., 32 Holes per Ring

Ring Drilling for Enlarging Main Tunnel, Circular Section, Rings Spaced 3½ C. to C., 30 Holes per Ring

Half-Section, Ring Drilling, Circular Penstock Tunnels, Rings Spaced 3' C. to C., 28 Holes

Longitudinal Section Showing Method of Shooting for Enlarging

FIG. 5—RING-DRILLING AND SHOOTING DIAGRAMS FOR PENSTOCK TUNNEL

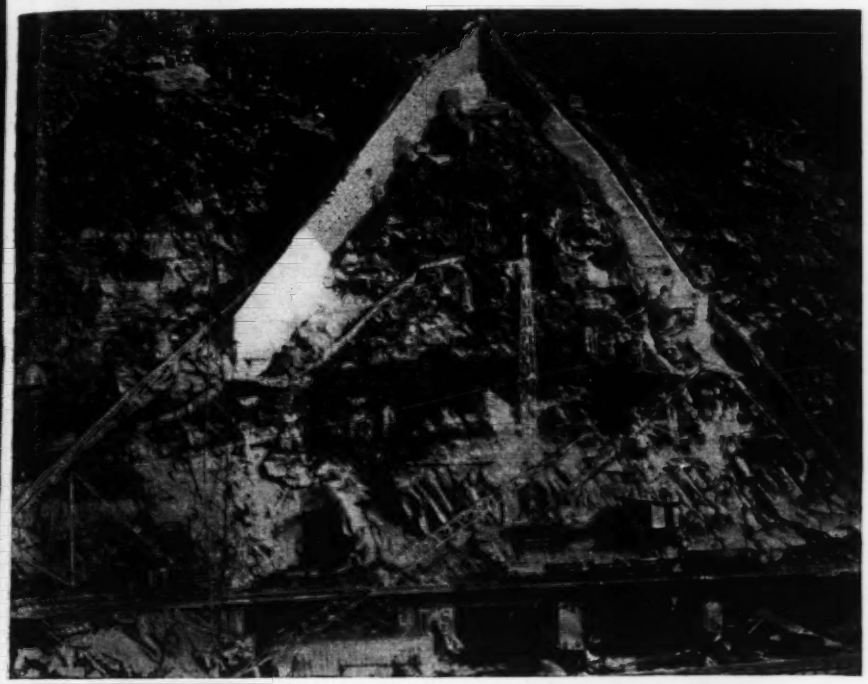


FIG. 8—CONCRETE DEFLECTION WALLS ABOVE POWER HOUSE
Concrete for walls hauled up incline tracks. Adit to main pressure tunnel shown at left above trestle. Penstock portals can be seen beneath trestle with one penstock pipe in place.

on rails set on concrete blocks, the rails being left in place as the space between the pipe and tunnel was filled with concrete.

The first operation in lining the tunnel was to pour the lower corners or shoulders. All concrete was mixed at a central plant about ¾ mile from the portal. Concrete for the shoulder was poured from high hopper cars. A steel form 30 ft. long, running on tracks placed on the concrete shoulders, was used for the side walls and arch. Two 14-cu.ft. pneumatic placing machines poured the side and arch sections, each machine running on tracks placed along the side of the tunnel. An 8-in. pipe line led from each machine over a scaffold car running on a central track to the forms. All equipment was moved forward by a locomotive as required. Concrete was brought from the central plant to the portal of the adit in 2-cu.yd. dump buckets on flat cars and was then dumped into hopper cars for transportation to the pneumatic machines, the buckets being handled by a stiff-leg derrick.

A 30-ft. section of sidewall and arch required from 160 to 175 cu.yd. of concrete. The forms remained in place fourteen hours after the pour was completed. From four to five hours time was required for removing and resetting the form. Actual pouring operations required about six hours. This schedule permitted 30 ft. of lining to be poured daily. An unusual feature of the tunnel lining was keeping the invert concrete close behind the arch lining. Concreting the invert was done in 60-ft. sections on alternate days. The invert concrete was delivered by the pneumatic machines through pipes running through the form jumbo.

Electric vibrators of the same type used in tamping the dry concrete at the dam were clamped to the inside of the steel arch forms and operated during the pouring period. The main tunnel section was grouted uniformly through holes drilled 20 ft. on centers along the center line of the crown. Wherever a large pocket occurred in the walls or roof, grout pipes were placed in the forms before concreting.

The surge shaft, an 18-ft. circle inside of a 12-in. concrete lining, rises from the main tunnel at the head of the penstocks through solid rock on a 51-deg. slope. In driving this shaft a small heading 4 ft. in diameter was raised from the tunnel (El. 779) to the opening on the mountainside at El. 1,005. Stoper drills were used in the raising, the crew working from a platform hung from pins doweled into the rock. Enlarging was then started from the top, using the center heading as a chute for the muck. The surge chamber, which takes off from the shaft at El. 946, required over 4,000 cu.yd. of excavation. The excavation in both surge chamber and shaft totaled 9,500 cu.yd.

The shaft lining was carried up from the bottom using sectional wooden forms. Concrete was brought in from the top, being hauled up the side of the mountain from near the power house on an inclined railroad. The surge chamber is not lined except over the head of the surge shaft. It is a large chamber roughly 45x30x100 ft. long with the surge shaft coming up into it at one end. At the head of the shaft a rock trap is provided to catch and hold stones which might become dislodged from the unlined walls of the chamber.

Concrete Rampart Guards Power House

The construction of the power house involved only one operation out of the ordinary. Because of the steepness of the mountain rising above the power house it was necessary to build a heavy concrete gravity retaining wall, as shown in Fig. 8, in the shape of an inverted V, to deflect slides and rolling stones. The walls are securely doweled into rock. Concreting the walls was done from hopper cars handled by a cable and operating on inclined tracks, shown in Fig. 8. Concrete was mixed at the central plant and hauled to the incline in buckets, which were dumped into the hopper cars by a derrick.

Personnel—All work was done by the construction forces of the Aluminum Co. under the direction of James W. Rickey, chief hydraulic engineer, and James P. Growdon, assistant chief. J. E. S. Thorpe was general superintendent in direct charge until September, 1929, when he resigned to become president of the Nantahala Power & Light Co., a subsidiary of the Aluminum Co., developing a hydro-electric project on the Nantahala River in North Carolina. Mr. Thorpe was succeeded by I. G. Calderwood, for whom the Calderwood project was named. B. S. Philbrick and Lex Phiffer were assistant superintendents on the work, J. B. Hayes was resident engineer and W. P. Bailey was office engineer. W. R. Johnson was concrete technician in charge of inspection and testing.

Welding Applied to Gantry Crane Fabrication

Four Cranes of 71½-Ft. Span at Lumber Terminal in Brooklyn, N. Y., Prove Economical in Use of Steel—Welded Assemblies Also Used in Place of Castings

By R. F. Bessey

Formerly with Charles H. Moores Co., Inc., Consulting Engineers, New York City

ONE of the features of a recently reconstructed terminal on the Brooklyn waterfront is a lumber terminal, the storage yard of which is served by four completely arc-welded traveling cranes. These cranes operate on two runways, each about 950 ft. long, with a roadway between and with roadways and wharf margins on the outside.

For inviting proposals for these cranes a general plan and detailed specifications were drawn up, the specifications setting forth the following:

Type: Traveling, full-portal gantry, with cantilevers at each end of main span and portal legs to permit passage of trolley and load to cantilever. Man-trolley with hoisting and racking functions.
Span: 71 ft. 6 in. c. to c. of runway rails; cantilevers—outside 27 ft. 6 in., inside 14 ft. 3 in.
Clearances: Portal—lumber piled to maximum height of 40 ft. above top of rail; inside of legs to be vertical. Outside of legs to clear vehicles or railroad cars. End portals to clear trolley and load.
Height of lift: 45 ft. above top of rail
Capacity of hoist: 7½ tons
Hoisting speed: 40 ft. per minute
Trolley racking speed: 200 ft. per minute
Gantry speed: 350 ft. per minute
Operation: electric

In addition, the crane structures were required to be designed throughout for the following loads:

Hook load and weight of moving part (as trolley).
Wind load: 30 lb. per square foot on unloaded structure, or 15 lb. per square foot in combination with other loads or forces (on 1¼ times the vertical projection of structure on plane perpendicular to wind direction).
Impact: Vertical live loads increased 25 per cent.
Forces due to acceleration or deceleration of crane or moving parts, inequalities in traveling resistance (as wheel slip and crowding).

The specifications also provided for a factor of safety of not less than 5, instead of the usual 4. No mention was made of welding, but the lowest of eight bids received, that of the American Crane Co., was based on the use of arc-welding for all connections. This bid also included roller bearings which were not required by the specification. The proposed use of arc-welding was given careful consideration and, after study of a preliminary design, the engineers recommended its acceptance.

This acceptance was based on economy in cost and saving in weight of each structure, which was desirable because of reduction of soil pressure under runway tracks, which are in part on new fill.

The saving in weight is apparently about 30 per cent, while the saving in cost is at least 15 per cent.

Supplementary specifications were made to cover the arc-welding and the contract was awarded for the construction of the cranes as proposed. The maximum allowable stresses used in design of the welded connections, all of the fillet type, were as follows:

For welds parallel to line of stress (or in longitudinal shear):
Per linear inch of ¼-in. fillet, 1,600 lb.
Per linear inch of ⅜-in. fillet, 1,900 lb.
Per linear inch of ⅜-in. fillet, 2,200 lb.
For welds normal to line of stress (or in transverse shear): 80 per cent of values for longitudinal welds.

It was required that each welder, before being permitted to work on the job, make up tests specimens which should show, in tests to failure, a factor of safety of at least 5, based on the allowable stresses specified. A number of specimens were also made in the form of

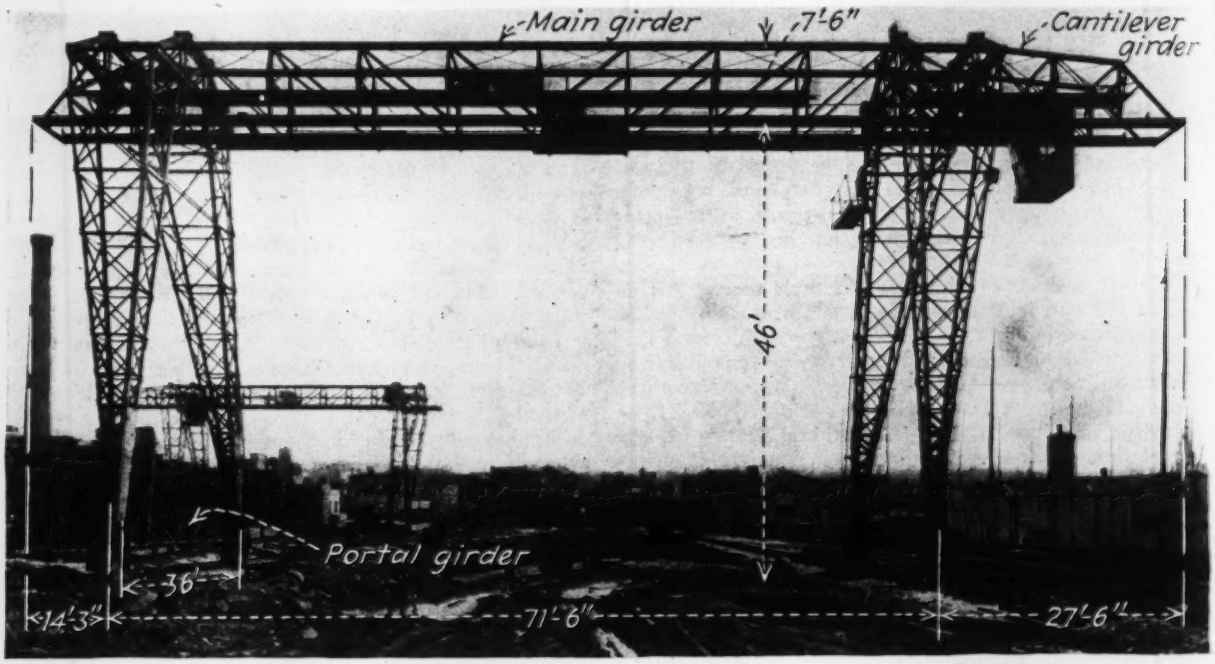


FIG. 1.—ARC-WELDED GANTRY CRANES FOR LUMBER TERMINAL SERVICE

FIG. 2—END VIEW OF MAIN CRANE GIRDER
Note that top and bottom chords are H-sections and that no gusset plate connections are used.

actual joints of the structure. Taken as a whole, the tests indicated the anticipated reliability of the welded connections.

The design and details are relatively simple. The main bridge is of the through type and consists of two Pratt trusses, with the trolley runway between, at bottom chord level. The trusses are braced laterally at each panel point and at top and bottom by a portal-type crossframe. The portal on each side of the crane is formed by a distributing truss, from which the main bridge is suspended, and which is carried by two battered legs. Each leg tapers from top to bottom with the bending moment and consists of four angles with crossbracing in the upper (deeper) part and plate connections in the lower (shallower) part. Latticed four-angle ties or portal girders connect the bottoms of the two legs on each side of the crane.

The main truss has 8-in. H-chords set with webs horizontal. The verticals are single 7-in. I-beams set into the openings between the flanges of the H's, and welded along the flanges of both H's and I's. The diagonals are pairs of channels laid flat against the flanges of the H-chords, one on each side and battened together between joints. These channels are welded along the end of the channel and an equal distance along each side of the channel. The top chord bracing consists of 5-in. I-beam struts butted against and welded all around to the flanges of the H-chords, and of flat-bar crossed diagonals welded to the flanges of the H-chords and welded together at intersections. The crossframes are each made up of the 5-in. I-top-chord bracing strut mentioned, a bottom member of two 4-in. channels and crossed diagonals of 2½-in. flat bars. The frame braces the bottom chord from the outside by struts made up of 3-in. channels and welded to the chords and the 4-in. channel struts extended. The trolley runway beams are supported by plate brackets or gussets welded to the flanges of the H of the bottom chord and of the I-beam verticals. Runway rails are welded to runway beams by short fillets at 18-in. intervals.

The distributing trusses carrying the bridge trusses at the tops of the portal legs are in pairs and are only three panels long, with top and bottom chords of two channels each, back to back, 8-in. H-diagonal end posts, verticals of two 7-in. channels, and crossed diagonals in the center panel of four 3-in. flat bars. The web members generally pass between the channels of the chords and are fillet-welded at surfaces in contact. Four-angle hangers are used at each intersection of top chord of bridge truss and top chord of distributing truss to carry the bulk of the vertical reaction from the bridge truss to the distributing truss.

The four angles in the portal legs are turned inward and the angle struts and diagonals are welded directly to the chord legs. The only gussets used are some inserted to stiffen the connections at the distributing trusses at the tops of the legs. The diagonals are crossed, with one angle on the inside and one on the outside of the legs of the chord angles. Welds of angles are laid out so that their moments on each side of the center of gravity axis of the member are approximately equal. The legs are cross-braced on all four sides and also have horizontal interior crossframes to prevent distortion.

The arc-welding process was used wherever practicable throughout the cranes, not only in the structural work, but in those mechanical details usually built of forgings and castings. The trolley frame is one unit, built up of plates, bars and other shapes completely welded and replaces the ordinary type designed with iron or steel castings and riveted structural steel. The equalizing trucks under the four corners of the cranes, each carrying two wheels, are of a construction similar to that of the trolley frames. The track wheels for both trolley and gantry travel are constructed of a forged steel outer rim, a hub of heavy steel tubing, and a web of a disk of plate reinforced by radial bar stiffeners, all welded solidly into a unit and afterwards machined to receive the bearings and turned to form the rail tread in the forged rim. All gears are built up of high carbon

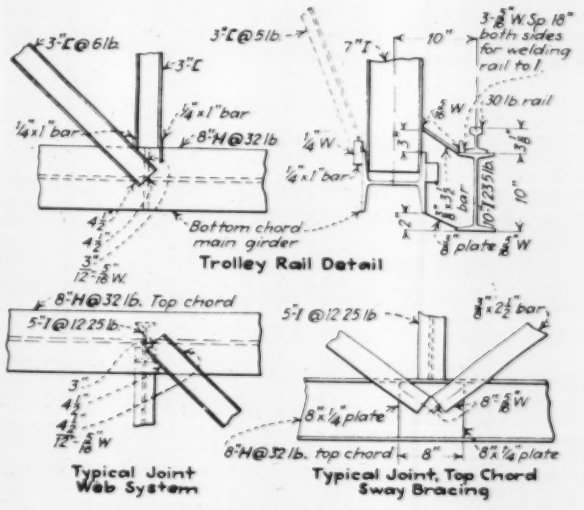


FIG. 3—TYPICAL WELDED DETAILS OF MAIN CRANE GIRDER

steel-forged rings for the rim or tooth section, hubs of extra strong steel pipe and webs of plate discs, all welded into a solid unit before machining.

The cranes were assembled in large units in the shop to keep field-welding at a minimum. The main bridge spans (including both trusses and bracing) were assembled in the shop, as were the pairs of distributing trusses and each portal leg. Other smaller shop assemblies were the bridge cantilevers, bottom portal ties, trucks, trolley, cage, etc.

The trolley poles are tapered, of four-angle section, with angle or bar lacing, designed for dead load of wires and pole and 30 lb. per square foot wind pressure, acting in any direction. End poles are special, unguyed, and designed to take the tension from the trolley wires as well as the other loads mentioned above. The poles are 52 ft. high with the exception of tw intermediate poles which are carried up to 90 ft. i height to support banks of floodlights for yard lighting.

The cranes, runways and trolley lines were constructe and installed for the Waterfront Service Corp., 7 Nineteenth Street, Brooklyn, N. Y., in accordance wit the specifications and general plans of, and under th supervision of Moores & Dunford, Inc. (succeeded b the Charles H. Moores Co., Inc.), of New York City consulting engineers. The cranes and poles were designed, detailed, fabricated and erected by the Amer ican Crane Co., of Friendship, N. Y., subject to the checking and supervision of the engineers. The crane will be operated by the Brooklyn Consolidated Lumber Co., also of 78 Nineteenth Street, Brooklyn, lessee of the lumber terminal.

Auditorium Trusses Designed With Polygonal Web System

Door and Window Openings Dictate Irregular Layout of Trusses Spanning Church Auditorium and Carrying Ten Stories of Residential Hotel

By Albion N. Van Vleck

Hurlbut & Van Vleck, Consulting Engineers, New York City

THE STRUCTURE replacing the old Calvary Baptist Church on West 57th St., New York City, is a combined church and residential hotel of sixteen stories, of which the church occupies a portion of the first five floors. The church auditorium, approximately 72 ft. wide and 100 ft. deep, has its ceiling just beneath the fifth floor level. The ceiling is formed by a series of four trusses 1½ stories deep and 72-ft. span c. to c. of column supports.

In order to utilize the space on the fifth floor over the auditorium, it became necessary to design these trusses so as to permit of many window and door openings through the web system, thus preventing all symmetry of truss layouts and duplication of truss designs. Trusses containing irregular polygonal web systems resulted, as shown in the accompanying illustration. It will be noted that the sizes and locations of the required openings precluded the possibility of utilizing trusses containing the usual web systems made up of triangles.

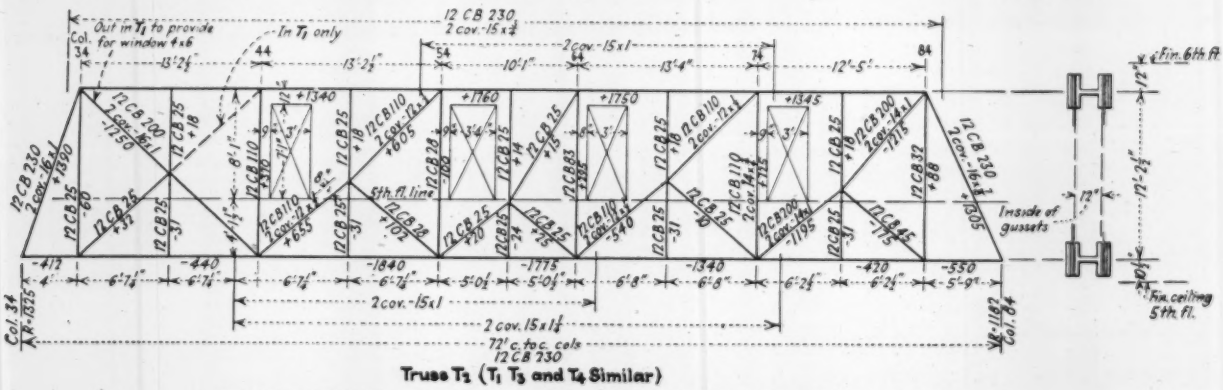
The solution of the stresses in the trusses was made by graphical means, the results being later checked analytically. In some cases, members which would normally have been under tensile stresses were found to be in compression. Very heavy stresses were encountered in many members and the use of unusually large gusset plates was required.

The writer's firm made an alternate design of the trusses, disregarding the door and window requirements and using the usual triangular system of webbing, and found that the resulting weight of the four trusses would have been about 50 tons less, or about 12½ tons per truss. Since the trusses as constructed weighed about 260 tons, the increase in weight due to the polygonal web system amounted to about 23½ per cent.

The trusses carried, in addition to the floor loads of the fifth and sixth floors and the duct space under the fifth floor, six columns each, which in turn carried the top ten stories of the building, with the exception of truss T3, which carried five columns. The loads carried through these columns varied from 266,000 to 587,000 lb. The reactions at the columns carrying the trusses varied from 1,017,000 to 1,684,000 lb.

In general, the columns resting on the top chords of the trusses were 14-in. H-sections and the load was transmitted into the trusses through steel billets interposed between the column and the top chord. The largest column, supporting the east end of truss T4, consisted of a 16-in. 413-lb. H; at its base, where it rested on the grillage, this column was made up of a 16-in. 363-lb. H with 18x1⅜-in. cover plates.

The structural steel and foundations for the building were designed by the writer's firm, Hurlbut & Van Vleck. The Easton Structural Steel Co., of New York City, fabricated and erected the steel for the Church Engineering Co., the general contractor. Jardine, Hill & Murdock were the architects for the owner.



HEAVY TRUSSES WITH POLYGONAL WEB SYSTEM USED OVER AUDITORIUM

Engineering Devices for Levee Protection in High Water

Battle Organization and Equipment and Munitions Constantly Prepared for Quick Mobilization When Levee Is Menaced by Rising Floodwaters

By H. V. Pittman

Area Engineer, Third Field Area, Memphis Engineer District, Helena, Ark.

FLOOD-PROTECTION engineering in the delta lands of the Mississippi does not end with the building of levees. High water sounds the call for comparable engineering skill and experience in the defense and protection of these earthen barriers. As soon as water is impounded the assault on the embankment begins. The attack becomes stronger as the water rises and the flood continues, giving the currents and waves opportunity to scour and break down the bank and the pressure time to penetrate the foundation and bring settlement, slides and sand boils. There is no cessation of the assault as long as the water stands against the levee. It has to be met by an equally constant defense, and the technique of this defense is the subject of this article. Description is first given of general procedure and then a specific levee-defense operation of the 1929 flood is described.

After a levee has been built by the federal government, the levee district which is protected becomes responsible for the maintenance. This obligation of the district holds for emergency work in times of high water as well as for normal maintenance. Only when the local organization has exhausted its resources and can no longer meet the emergency may the federal officials step in and protect the structure which they have built and the property that it was constructed to guard from flooding. This is the law and the theory; actual practice is entirely co-operative.

Every high water which rises against the levee line is recognized as a threat against its integrity, which at any time in some place may become a positive menace calling for action by the federal officials. They are, therefore, constantly organized for action. Generally, the organization is worked out in close co-operation with the local levee officials, so that when federal aid is required by the local forces, the organizations co-ordinate. Directing charge is taken by the federal body, at least in the emergency operations.

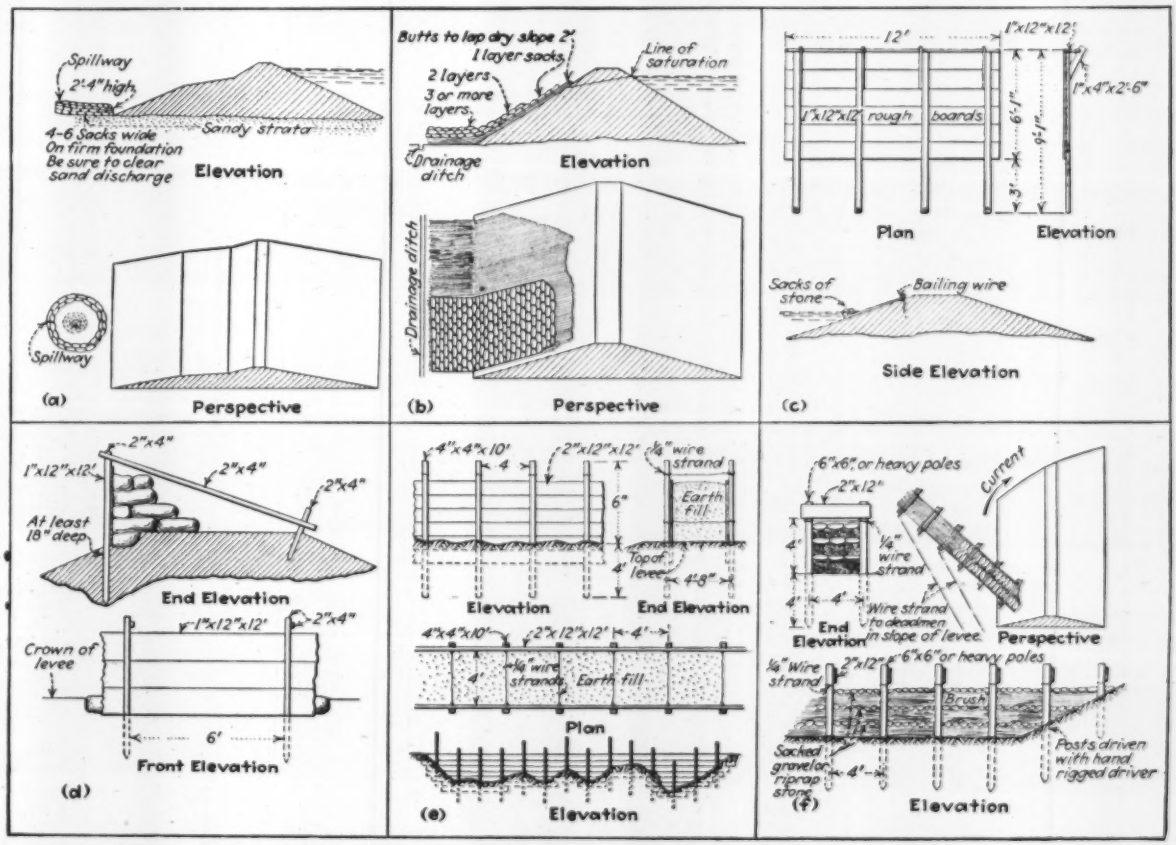


FIG. 1—DEVICES FOR PROTECTING MISSISSIPPI LEVEES AGAINST BREACHING BY FLOODS
(a) Sacking sand boil; (b) brushing and sacking sloughs; (c) movable wave-wash protection; (d) lumber and sandbag topping; (e) mud-box topping; (f) deflection dike.

The unit of federal organization is the engineer district, with the district engineer in general charge. Under him the staff heads of the operating division, the supply and repair depot, the administration division and the general engineering division function for the district as a whole. Direct field operations are in charge of the area engineers, each functioning in his own area and operating through his section engineers, inspectors, construction foremen and other assistants and in co-ordination with the levee board officials.

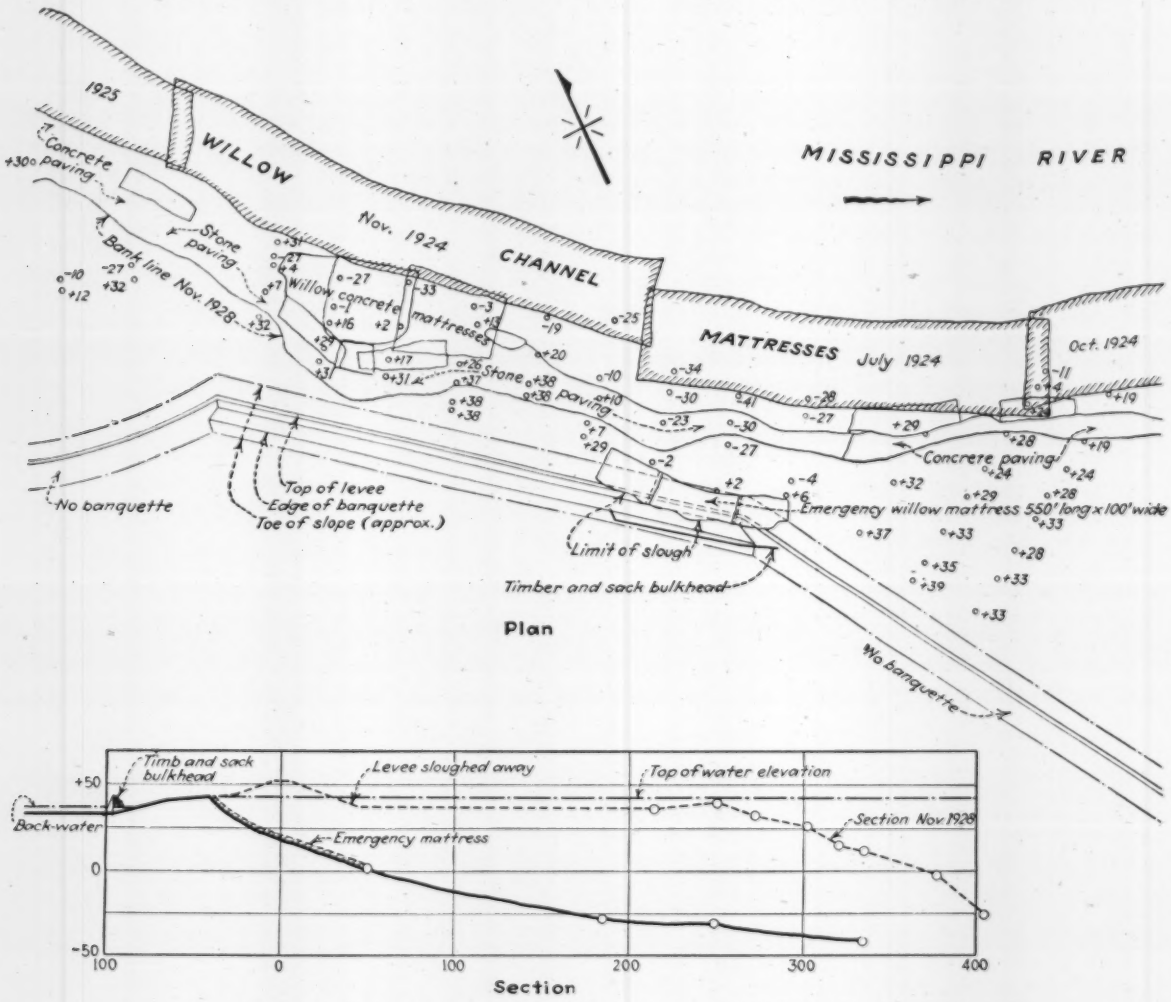


FIG. 2—BANK AND LEVEE MAP AND PROFILE OF BREAK, KNOWLTON LANDING, ARK.

General Emergency Procedure

The normal high-water operations in the field are inspection, patrolling, communication, materials supply and protection operations. Inspection and patrolling are normally the tasks of the local levee board officials; the area engineer's duty is to see that both activities are maintained and if necessary to maintain them by his own forces. The intent is that regular inspection trips shall be made by responsible men over the whole levee line to determine exposed and threatened sections which require attention. With the rise reaching 7 or 8 ft. over flood stage, patrolling begins. At first, day patrolling only is maintained, but as the rise becomes menacing, night guards also are put on and virtually constant sentry duty is established. A close line of communication is set up between levee and area off[illegible] and from there to district headquarters. Meanwhile supplies and equipment are requisitioned and mobilized and stand by ready to be concentrated where protection operations are required.

Commonly the destructive action of the water takes one or more of the following forms: sand boils or penetration under the levee; sloughing embankment; wave wash; overtopping and scour. Practice has developed a defense for each, which is illustrated by Fig. 1. These may be defined as the conventional protection measures; in actual practice several others are also employed, as will be described later. Enumerating the illustrations:

Fig. 1a indicates the common method of handling sand boils or the artesian-like upflow of water penetrating under the levee and coming to the surface back of the land side toe. Briefly, a watertight wall of sandbags is built up around the boil until the water within the ring has attained a head which balances the effective head causing the boil.

Fig. 1b shows the methods of reinforcing the back slope of the levee, which has become saturated by seepage and is in danger of sloughing. A thick layer of brush is laid down the slope and out beyond the toe and then one or more layers of sandbags are shingled over the brush to hold it in place. The theory is that the

FIG. 3—WEAVING EMERGENCY MATTRESS AT KNOWLTON LANDING

brush layer gives free escape to the seepage water while holding the earth from slipping.

Fig. 1c shows the method of preventing wave wash by a temporary slope paving of lumber. The paving sections can be shifted up or down the slope as the water level changes with the rise and fall of the flood.

Fig. 1d is a method of increasing the height of the levee by a board bulkhead and sandbag backing. Other methods of levee topping are a wall of sandbags or a narrow dike of earth thrown up from the banquette. Fig. 1e shows a mud-box topping.

Fig. 1f shows the construction of a diversion dike designed to turn a scouring current away from the levee.

Fighting the Knowlton Crevasse

A narrative of a high-water fight perhaps best indicates procedure and methods as they are applied by the federal levee officials. The location of the threatened break was near Knowlton's Landing, Ark. Here on April 18 in the high water of 1929, a serious slough occurred in the main line Mississippi levee. The break at first was only 80 ft. long, but it gradually lengthened

FIG. 4—EMERGENCY OUTFIT FIGHTING THREATENED BREACH
In distance is brush-mattress weaving operation shown by Fig. 3. In foreground men are filling sacks for sandbag walls.

FIG. 5—TOPPING WALL AND BULKHEAD OF SAND BAGS
Looking downstream, front line wall is shown at left and bulkhead at land side of levee on right.

at both ends to about 500 ft., reaching about half way into the 40-ft. banquette. The river level was then $\frac{3}{10}$ ft. below the crest of the banquette left standing and about 7 ft. above the backwater on the land side of the levee. The situation was critical but it was favored by a southwest wind of slight intensity, so that danger from waves overtopping the banquette was not of immediate concern. The accompanying plan and typical section, Fig. 2, show the engineering details of the locality, the break and threatened crevasse and the emergency work installed to prevent breaching.

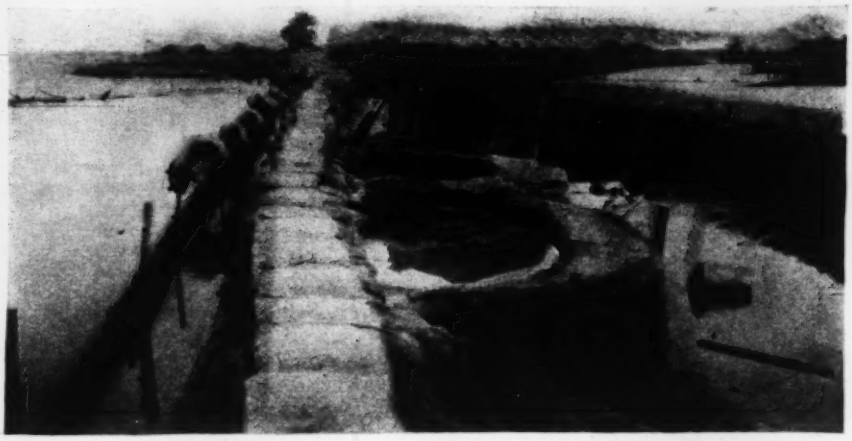


FIG. 6—FRONT LINE WALL WITH SEEPAGE RINGS
Looking downstream, front line wall is at left and bulkhead at right. The ring walls are built to close off seepage through main wall. Undisturbed levee in distance.

Mobilizing Forces—Due to backwater from the Mississippi and White Rivers, the locality of the break was practically isolated from approach by land. Patrolling by U. S. inspectors had been in force since early March, and within a few minutes after the break occurred, one of these inspectors was at the site where he made the necessary examination, then proceeded by horse and motor boat to the nearest phone, located at Ferguson, some 6 miles distant, and furnished the area office, in Helena, Ark., with the information.

Fortunately, there was at Avenue Landing, Ark., one of the revetment plants laid up in winter quarters, undergoing repairs and waiting favorable river stages for the resumption of construction operations. The patrol inspector was, therefore, directed to convey instructions to the chief of the revetment party to proceed immediately to the Knowlton break with steamer, barge of stone, all available labor, etc., to apply emergency measures by placing stone to prevent further scour along the caving section, and also to make preparations for moving in such revetment plant, supplies, tools, labor, etc., as were to be provided for more extensive work. The district engineer at Memphis was notified at once of the situation, with a request for additional district assistance in the way of levee bags, subsistence and miscellaneous supplies, steamboat service, etc. From the revetment party located at Trotters, Miss., about 65 miles above the break, there was obtained a steamboat, two barges of brush, two barges of stone, supervision and additional supplies. On the way down, this steamer took on board at Helena lumber for levee-bag bulkhead, 10,000 levee bags, tools and miscellaneous construction material and supplies, and 200 laborers. These reached the site of the

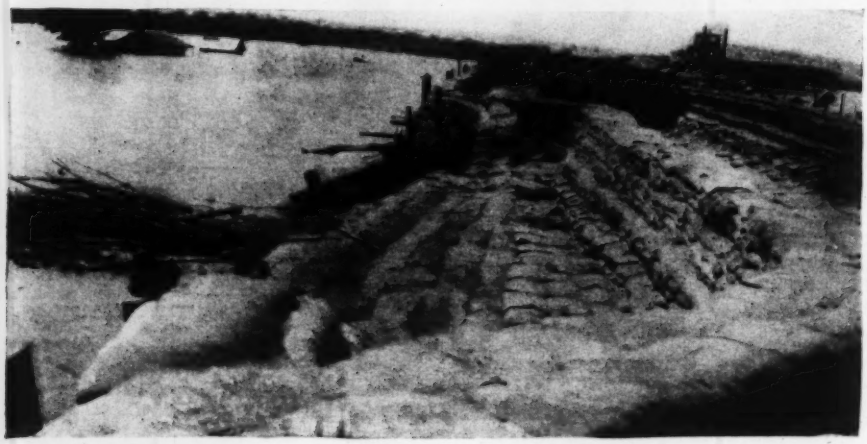


FIG. 7—SANDBAG BULKHEAD OFFSET WALL
View on land side, showing back water which breached board and sack bulkhead, requiring offset wall and shingling of sandbags to repair damage.

work early Friday morning, April 19, 1929. In the meantime, the steamer from Memphis had departed, arriving at Avenue Landing, Ark., at 9 a.m. Here, the mat-building plant was picked up and the whole delivered to Knowlton at 1:30 p.m. The steamer "Saturn," equipped with wireless, was dispatched from Friar Point, Miss., where it was engaged on discharge observations, to Knowlton, and hourly communication was maintained with the district engineer at Memphis throughout the emergency period.

The method of securing the necessary labor was equally prompt and drastic. Only about 50 negro laborers could be obtained locally, and it was necessary to get additional labor, totaling about 250 negroes, from Helena. An emergency call was phoned to the chief of police and the county sheriff, who, together with their deputies and other assistants, in trucks and motor cars, and armed as though for a riot, impressed in less time than it takes to tell, the labor that did the job promptly. However, these negroes proved to be efficient and cheerful, and worked diligently in fair weather or foul, in spite of the fact that a high-water fight is the last thing on earth a negro desires to attend.

Methods Used—Emergency measures were immediately undertaken to construct a willow protecting mattress along the dangerous section, 500 ft. long by 100 ft. wide (Fig. 3). At the same time a levee-bag and supporting timber bulkhead 550 ft. long by 6 ft. high (Figs. 4 to 7) was built along the land side toe of the banquette, where backwater and seepage endangered the safety of the remaining banquette section. Both of these jobs were pushed energetically day and night, working two twelve-hour shifts. By 10 p.m. Monday, April 12, all work contemplated was completed. With the river developing a slight fall, it was felt that all danger of a crevasse was removed, temporarily at least.

Probable Cause of Break—From survey and examination, it appears that serious scour developed between the top of the revetted bank and near the toe of slope of levee, this area being the site of the old borrowpits from which material was obtained to build the adjacent section of levee. The bottom of these narrow pits was about 3 ft. below the top of paved bank, the excavation reaching to such paved slope. Apparently, this artificial channel served to create a swift-flowing upstream eddy extending from the upper levee angle to the lower levee angle and of such force as to erode to a depth shown on the accompanying typical section, Fig. 2. After the sloughing of the section this action lessened, and when the work was finished, it had practically ceased.

Groundwater Infiltration in Pipe Sewers

Excess of Groundwater Increases Load and Cost of Sewage Works—Various Experiences With Pipe Joints—Relation to Sizes of Pipes—Cracked Pipe a Serious Factor—Specified Limits and Methods of Measuring Water

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With the increased demand for sewage treatment, the question of groundwater infiltration in sewers becomes increasingly important for both combined sewers and separate or sanitary sewers, since excess of groundwater affects the construction cost and operating cost of treatment plants by reason of the greater volume of fluid to be cared for in the various tanks and structures. At a recently built plant whose design was based on measurements of the spent water supply, tests during operation showed that the amount of infiltration water was four times that of the spent water.

Reference books give data indicating that in the older sewerage systems infiltration varies from 20,000 to 264,000 gal. per mile per day. Most of these systems were built before much attention was given to control of infiltration. In discussion of a paper by John W. Brook on "*Infiltration of Groundwater into Sewers*" (*Transactions*, Am.Soc.C.E., 1913), it is stated that in New Orleans from 1907 to 1913 infiltration averaged 55,000 to 42,000 gal. per mile per day. Recent engineering literature contains considerable information as to infiltration and the type of joint best suited to minimize it. Manufacturers have appreciated the importance of good joints, and many special joints have been devised.

Sewer Joints in Wet Ground—Information regarding sewer joints is conflicting, especially where wet or soft excavation is involved. Some engineers have found various types of cement mortar joints satisfactory in bad ground, although many prefer the use of premolded or hot-poured asphaltic joints, and still others have found asphaltic joints unsatisfactory. At Miami, Fla., in 1928, infiltration on 16.3 miles averages 1,200 to 7,025 gal. per mile per day in different sections. Joint trouble was overcome by using a canvas form hemmed at both sides for wire and securely tied around the joint, which was first filled with a strand of oakum or jute. The canvas form was then filled with 1:2 grout of the consistency of thick cream, and the top of the joint was finished with a handful of stiff mortar just before initial set. At Altoona, Pa., several years ago, on 2 miles of 12-in. and 0.8 mile of 8-in. sewer in wet ground, the infiltration did not exceed 6,000 gal. per mile per day. In wet ground at Salt Lake City, in 1927, it was as high as 39,700 gal. per mile per day, with cement joints.

Types of Joints—Of 44 cities with more than 100,000 in population, replying to a questionnaire, 21 use a poured asphaltic joint or some type of premolded asphaltic composition joint in bad ground. Of the remaining 23 cities, six reported a poured cement mortar joint using a special gasket and form, and the others reported the standard jute and cement mortar joint or a modification of it.

At Richmond, Va., cement-wiped joints wrapped in muslin are used, after experience with various com-

FIG. 1—MORTAR IN LOWER PART OF BELL READY TO RECEIVE SPIGOT OF NEXT PIPE
Note the concrete bedding cradle in which the pipe rests.

FIG. 2—TAMPING THE YARN HOME IN UPPER PART OF BELL
After yarn is inserted mortar is placed with gloved hands.

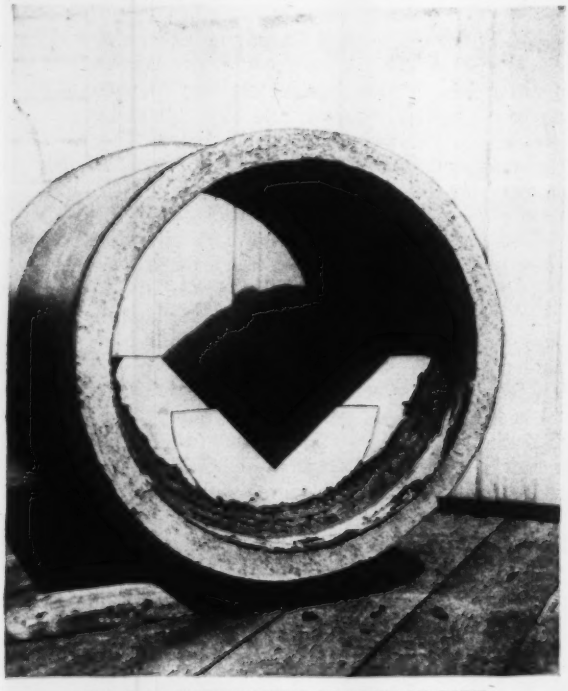


FIG. 3—V-NOTCH WEIR PLACED IN PIPE TO MEASURE INFILTRATION

pounds. At Buffalo, N. Y., joints are required to be calked with approved premolded or asphaltic compound, and concrete cradles are required for pipe sewers. Such cradles are used also at Washington, D. C., where joints are calked with jute and filled with bituminous compound. At Minneapolis, tightly fitted pipes with good cement joints beveled and packed with loose oakum soaked in cement grout and tightly driven have given as good results as any other method tried. Tests at Philadelphia, Pa., show from 500 gal. per mile per day on small pipe sewers, to 10,000 gal. on concrete sewer 11 ft. 8 in. in diameter, these excellent results being due undoubtedly to the practice of laying all pipe sewers in concrete cradles or full incasement. Two statements as to sewer-joint construction are appended.

Baltimore, Md., Milton J. Ruark, sewerage engineer—Infiltration of groundwater can be minimized or eliminated only by using extreme care in making joints, regardless of what kind of material is used. Where groundwater is encountered in large quantities, an underdrain laid in gravel provides the best and most economical means of making satisfactory joints. Bituminous or poured joints cannot be made satisfactorily if groundwater interferes. Where sewers are constructed through filled ground and slight settlement is likely, some type of bituminous joint is preferable to rigid cement joints, because a certain amount of flexibility is obtained without the probability of breaking the bell of the pipe.

Flint, Mich., H. C. McClure, city engineer—Some years ago gagings indicated infiltration of 800 to 1,800 gal. per acre per day. In sanitary sewer design we allow a mean and maximum of 1,100 and 1,800 gal. For five or six years we used joints of bituminous materials on some sewers in bad ground, but investigations and experiments about a year ago caused us to change to a joint which we find more satisfactory. In making these joints, the operations are as follows: A bell hole is dug slightly larger than ordinarily required, and an excess of cement is laid in this on both sides, so that it can be reached easily after the pipe is placed. A full strand of unplucked oakum of proper size to fit the annular space is wound tightly around the pipe, and the pipe-layer and helper then place the pipe in the bell and carefully push it home. This operation produces a rolling action on the oakum which causes it to pack tightly. The top half of the oakum is then calked. The helper reaches under the pipe and lifts the cement up around the lower half of the pipe, using rubber gloves which we provide. The cement is carefully packed into and around the joint, leaving a considerable excess. The top is properly plastered and beveled. This method produces a joint which we found quite impervious to infiltration, and pipe left under a head of 5 ft. of water for some 24 hours showed no signs of leakage. In experiments, almost equally good results were obtained from the use of oakum alone, placed as indicated above. Our pipe-layers lay the new joints as fast as the ordinary joints.

Investigation of sewers having the old style joints showed that when the cement is first laid in the bell and the loose oakum is then inserted, the oakum forces the cement into a thin film, at most ¼ in. thick, in the bottom of the joint. In a wet trench, it requires only a small amount of water to wash this film of cement away and leave an opening. In sewers laid with preformed joints we have found the material hardened, cracked and broken away from the pipe. In most cases the leakage was due to failure of the material to bond around the bell, although the spigot had first been wiped with hot compound. We had extreme difficulty in securing satisfactory joints, using premolded gaskets without subjecting the pipe to undue strain or breaking it.

Limits of Infiltration—Of the 44 replies to a questionnaire already mentioned, fourteen indicated that sewer specifications included a clause limiting the maximum allowable amount of infiltration. Ten indicated that infiltration was allowed for in the design and watched closely during construction, but that no definite limit was established in the specifications.

A large Pacific Coast city limits infiltration by the formula $I = 0.0006\,dL$, where d is diameter of pipe in inches, L is length of sewer in feet, and I is infiltration in gallons per minute. For 8-in. pipe this equals 36,495 gal. per mile per day. A poured cement joint is used, with gaskets and forms. In Syracuse, N. Y., the limit

is 200 gal. per inch of diameter of pipe per mile per day, with plastic compound joints. A city in Oklahoma specifies the maximum at 25,000 gal. per mile per day, using aspahltic joints. At Zanesville, Ohio, the limit is 10 gal. per minute per mile, using asphaltic compounds or premolded asphaltic joints.

Contractors object to specifications limiting the allowable amount of infiltration on a sewer contract, particularly when the specifications detail the manner of laying pipe, excavating and backfilling and forming joints. In the writers' experience good results can be obtained, with active cooperation from the average contractor, where the methods of construction are outlined in detail in the specification without placing a limit on the allowable infiltration. It is probably due to this fact that few large cities specify the amount of infiltration permitted

FIG. 4—TWISTED JUTE GASKET LAPS AT TOP

Plastic mortar spread in bottom third of bell of pipe already laid and gasket squeezed into it before spigot of next pipe is entered. Gasket then calked and remainder of annular space filled with mortar, using rubber gloves.

Methods of Control—In the writers' practice during the past few years, infiltration tests have been made regularly during construction and also after completion, the total involving approximately 550 miles of combined and sanitary sewers and embracing a variety of construction conditions. Much of this work has been in bad ground. The results represent what is feasible in average sewer construction. At first, tests showed from 3,700 to 39,200 gal. per mile per day. Later, tests at intervals of 1,000 to 3,000 ft. were insisted upon, and considerable attention was paid to joint construction and to the structural safety of the sewer by limiting the width of the trench at top of pipe and by using concrete cradles where needed.

During the last two years, tests gave from 846 to 13,250 gal. per mile per day, while 90 per cent of the results were between 1,600 and 7,700 gal. Occasionally, a short section in wet sand would show as high as 50,000 gal., but this could usually be improved by repairing bad joints or replacing cracked pipe. All tests were made by triangular weir measurements, and most of those on completed systems were made during or after prolonged heavy rains. It was noted that size of pipe had comparatively little effect.

Cement mortar joints were used in average ground and included calking with a twisted gasket of jute of specified thickness and of sufficient length to pass around the pipe and lap at the top. Plastic mortar is first spread in the bottom third of the bell of the pipe already laid, then the gasket is placed and is squeezed tightly into the mortar before the spigot of the next pipe is entered. After the new pipe has been bedded to line and grade, the gasket is calked and then, with the use of rubber gloves, the remainder of the annular space is filled with plastic mortar beveled to the outside of the pipe. The 1930 specifications require the jute to be saturated with neat cement grout.

In bad ground such as wet sand or soft yielding clay and loam, either a hot-poured asphaltic compound was used to seal the joint after a jute gasket had been calked into the joint, or in a few locations preformed asphaltic gaskets were installed with a jointing device capable of exerting a horizontal pressure of 1,500 lb. For cement joints in wet ground, each joint was wrapped with cotton cloth. Particular care was taken to get good joints where stoppers were fited into Y's and T's. Monolithic-concrete manholes were used to prevent excessive leakage through manholes.

Infiltration Tests—Methods of expressing infiltration include gallons per day per linear foot of joint, gallons per square yard of interior sewer surface, gallons per acre of tributary area, gallons per day per capita of tributary population and gallons per mile per day. This last unit seems to be in general use, although there are a number of theoretical objections to it. However, some of these objections are discounted by the fact that the larger sewers are now usually built with better joints and structural strength than formerly.

The writers' experience is that, when soil conditions are uniform, infiltration for 24- to 36-in. vitrified or concrete pipe is only slightly more than for 8 to 21-in. pipe. The difficulty in forming a good watertight joint seems to decrease with the diameter of the pipe. On sewers larger than 36-in. and up to 84-in. diameter infiltration seldom runs much higher than with the smaller pipe, because a better type of joint is employed and practically no cracks develop in the pipe. The quantity of large pipe is ordinarily a small proportion of the total length, so that the total infiltration is not affected materially by that in the larger sections, particularly with a good type of joint and proper structural design. Similar experience has been noted at Long Beach, Calif., where tests on 18- to 42-in. sewers showed less infiltration than for 8- to 12-in. sewers.

The usual method of measuring is to set a triangular weir in the downstream manhole of the section of sewer to be measured. The proper time is when the groundwater level is high after prolonged rains. Because of the great variation in infiltration due to variations in the elevation of the groundwater level, to varying depths of sewers and to the changing character of the overlying soil, extreme refinement in weir measurement is not justified. If it is not possible to make measurements during construction under conditions which might produce maximum infiltration, care must be taken in interpreting results. Frequent tests during construction and before backfilling are desirable in order to locate bad joints. These tests should be checked by one or more tests of the sewer system after backfilling and after or during prolonged heavy rain.

Where the sewers carry sewage or surface water during the tests, the matter is complicated and some means for determining the effect of such factors must be devised. Considerable attention has been given recently to the hydraulic method of testing, by filling a blocked-off section of sewer with water under a head of 4 to 8 ft. and measuring the fall of the water level during a period of time. This method is more cumbersome than weir measurement, but has an advantage in disclosing bad joints or cracked pipe before the filling is done. There is some question whether the results are comparable with actual infiltration, and it would be interesting to learn how such tests compare with later weir tests. Engineers who have such data would confer a general favor by publishing the results.

At Dayton, Ohio, the specifications provide for tests substantially as follows:

Each section of sanitary sewer, between two successive manholes, shall be tested by closing the lower end of the section

and the inlet sewer of the upper manhole, and filling the pipe and manhole with water to a point 4 ft. above the invert of the open sewer in the upper manhole. For joints made with cement, the allowable leakage will be computed by the formula

$D = L\sqrt{h}\ 0.0002\ \frac{S}{8}$ in which D is the allowable drop in feet per minute in height of the water in the upper manhole, S is the diameter of the sewer in inches, L is the length in feet of the sewer tested, and h is the difference in elevation in feet between the invert of the closed sewer in the lower manhole and the surface of the water in the upper manhole, or the head of water on the invert at the closed end of the sewer.

When joints have been made with compounds, the factor is 0.00004 instead of 0.0002. If leakage as shown by the test is greater than allowed by the formula, the pipe shall be overhauled and if necessary relaid until the joints hold satisfactorily under this test.

Cracked Pipe—Even perfect joints will not eliminate infiltration if the sewer itself becomes cracked. This condition is almost universal in old sewers, especially with the larger pipes laid without cradle in bad ground

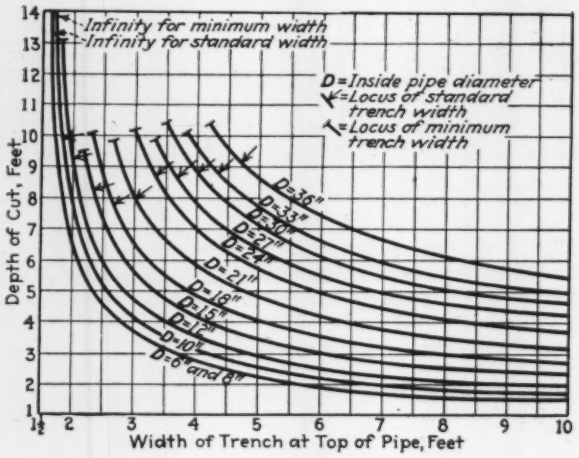


FIG. 5—SAFE DEPTHS OF TRENCH

This diagram is for saturated clay. Similar diagrams have been prepared for other soils.

at depths of more than 10 ft. It occurs sometimes also in present-day construction.

From examination of old sewers that have collapsed and from experience in building new sewers, it is believed that to neglect Dean Anson Marston's theory of loads on pipe in trenches is to court disaster. In one instance a line of 27-in. clay pipe covered with 10 to 12 ft. of damp clay was known to remain intact until soaking rains occurred, but immediately after the rainy period about 20 per cent of the pipes were found cracked. Obviously, the rains had converted the damp clay into saturated clay, which imposed a load the pipes were not able to carry. It is certain that sewer pipe may not crack until some considerable time after backfilling, and this probably accounts for the fact that infiltration does not often diminish with time, as might otherwise be expected from the silting of porous joints. As Dean Marston has pointed out, the width of the trench has a great influence upon the magnitude of the backfill load.

In accordance with this theory of loads on pipe in trenches, diagrams have been developed by the writers to show the safe depth of trench from ground surface to flow line for various trench widths and pipe diameters. The diagram for "saturated clay" soil is shown in Fig. 5 and is based upon the following assumptions: (1) that the pipe strength equals A.S.T.M. standards for clay pipe; (2) that the safe cut depth is such as will cause a fill over the top of the pipe equal to two-thirds of the fill theoretically required to impose a load equal to the pipe strength; and (3) that ordinary pipe-laying conditions apply. It shows the important relation of trench width to safe depth of cut. Similar diagrams for other kinds of pipe and other classes of soil are used by the writers.

Conclusions—Some general conclusions drawn from experience and from the conflicting reports mentioned are as follows:

1. The avoidance of cracked pipe by providing a sewer design of sufficient structural strength to sustain the backfill loads is a fundamental necessity.

2. Rigid inspection, with an inspector closely observing the trench width and the formation of each and every joint, is most important. One inspector cannot satisfactorily observe the joint work on four or five construction operations. Groundwater should not be allowed to rise around the joint or flow through the pipe until the joint is set. Careful workmanship secured by rigid inspection is more important than the selection of the type of joint.

3. Infiltration tests must be made as the work progresses, say at intervals of 1,000 ft., and also after completion of the work to determine the effect of the backfilling.

4. Selection of joint must be based on previous experience in similar ground or by experiment with various types of joints.

5. Basing permissible infiltration upon pipe diameter is not justified. With proper construction, rigid inspection and a proper type of joint, infiltration in very wet ground may be safely limited to 10,000 gal. per mile per day and in average ground (ordinary clay and fairly dry sand) to 5,000 gal. for sewers up to 84 in. in diameter.

6. If the specifications limit the amount of infiltration, the contractor should be allowed to choose the type of joint. Otherwise no limit should be set, but the engineer should depend on his own judgment in selecting a type of joint satisfactory for the local conditions and should demand and obtain capable inspection. With either method the final results should be about the same.

7. The influence of the elevation of groundwater on infiltration is considerable, and care should be taken to reduce this elevation by the construction of storm sewers or other means wherever possible. In wet ground the infiltration may be reduced by such design of separate sewers as to avoid excessive and unnecessary depths.

8. The hydraulic method of testing for infiltration is of considerable value in many locations when used during construction, but should be checked by weir measurements in the completed sewer system.

Wind Pressure on Tall Chimneys

Results of an investigation of the wind pressures on chimneys and other cylindrical structures, obtained by model testing in wind tunnels and by measurements on existing chimneys, are discussed in the September number of the *Journal of Research*, issued by the U. S. Bureau of Standards. The data indicate that wind pressure is a function of the ratio of the height of the chimney to its diameter and that a pressure corresponding to 20 lb. per square foot of projected area at a wind speed of 100 m.p.h. is a safe value to use in designing chimneys of which the exposed height does not exceed ten times the diameter.

Public Works Officials Discuss Their Many Problems

THE following rather unrelated subjects treated Oct. 9 to 11 at the meeting of the International Association of Street Sanitation Officials indicate in a measure the diversity of field which this once closely restricted organization now proposes to cover. In a way it vindicates the change of name to International Association of Public Works Officials. —EDITOR.

IN A paper on street crossings of railroad tracks P. J. Hurtgen, director of public works, Kenosha, Wis., stated that the old type of plank crossings was entirely unsatisfactory, even though an asphalt coating was applied over the planks. Old rails, however, placed close together within the track zone and the area in between rails filled with an asphaltic mixture of cold-patch material are giving satisfaction and do not necessitate any maintenance. Precast reinforced-concrete slabs, 5 ft. long, 5 to 7 in. thick and 16 in. wide, fastened to the ties with lag screws, have been satisfactory. Another type of concrete crossing is the monolithic type with an idle rail along the inner side of the track. As used by the Michigan state highway department, this construction provides for a 6-in. timber tie of the same length as the regular ties, laid parallel with them but with the bottom laid 2 ft. below the top of rail. A 6x8-in. timber is laid on top of these base ties parallel and under each rail. Then come the regular ties. The space left between the ties is filled with concrete to a width of 5 ft. on either side of the center line of the track.

Costs per foot of various types were given as follows:

	Original Cost	Yearly Cost
Oak plank	$3.00	$2.19
Rail-type asphalt filler	8.00	1.15
Concrete plank	8.00	1.24
Monolithic concrete	10.00	1.37
Asphalt plank	6.00	No information
Treated gumwood	4.00	1.70
Cast-iron	14.00	1.40

The Dearborn Experiment

Sewage sludge from Imhoff tanks and garbage are inoculated in Dearborn, Mich., with bacterial growth developed by Dr. George H. Earp-Thomas. Mark B. Owen, superintendent of public works, described the Dearborn laboratory where 500,000 gal. of sewage and 15 tons of raw garbage are treated daily.

Paper pulp from waste paper is added to the sewage to assist settlement of solids and also slaked lime and ferric chloride. This reduces the detrition period from three hours to one hour or less. A rotary vacuum filter reduces the moisture, and the liquor discharges upward through screen-bottom trays covered with a 2-in. layer of magnetite; it is then chlorinated. The garbage is shredded and centrifuged to reduce the moisture. Bacteria are added to this almost fluffy material, which is passed through a standard apparatus used in mining. This mixes, aerates and expedites release of moisture by heating during digestion. This digestor can take sewage, garbage and sludge singly or together.

While results are yet preliminary, Mr. Owen stated that they have doubled the efficiency of treatment and cut in half the time required. Fifty tons of raw garbage have given 15 tons of dry end product, the reduction being due to water loss.

The inoculation material is a fine grade of peat to which is added bacterial jelly containing 126 specific organisms. It is too early to announce any results.

Salvaging Wastes

In Washington, dumps are gone, and the city cares for wastes in a salvaging plant. In 1930 the net costs, including all expenditures for equipment and land purchases, were $2.84 per ton. The gross cost for nine years has been $0.576 per cubic yard, or $5.12 per ton. The total revenue was $0.436 per cubic yard, or $3.88 per ton. The net cost, excluding expenditures for land and equipment, was $0.118 per cubic yard, or $1.05 per ton. These figures were given by Thomas L. Costigan, superintendent of street cleaning, Washington, D. C.

A $140,000 salvage plant, built in 1911 for disposal of rubbish in Rochester, N. Y., has two 50-ton incinerators, storage bins, press room and picking and sorting rooms. The city operates a 200-ton reduction plant for garbage. Steam made in the salvage boilers is utilized in the reduction processes. Costs are $2.50 per ton with a sixteen-hour daily operation, but the plant is grossly overloaded. Future extensions, said John V. Lewis, director of maintenance and operation, department of public works, will mean abandonment of the salvage operation and substitution of straight incineration.

In southern California, according to R. W. Stewart, chief deputy city engineer, Los Angeles, no one is trying to purchase garbage for reduction, but hog raisers will call for it at a central point and pay a good price. A ranch 60 miles out of Los Angeles, supporting 50,000 hogs, pays the city 60 cents per ton and a freight bill of $1.20 per ton. All of the other 43 cities in Los Angeles County have disposed of their garbage to hogs for five years.

Abstract of papers presented Oct. 9 to 11 at Louisville, Ky.

Air Leakage Through Building Walls

Tests to determine the relative amount of air leakage through more than 40 varieties of frame construction such as are commonly used in residence building have been conducted at the University of Wisconsin under the auspices of the American Society of Heating and Ventilating Engineers. Panels constructed of representative grades of material, with workmanship comparable to that in ordinary practice, were subjected to air pressures corresponding to those on a building at wind velocities of 5, 15 and 30 m.p.h. Most of the panels included one finished surface only, either the inside or the outside of the frame wall. The few tests on complete walls proved, as expected, that under laboratory conditions the air resistance is that of the tightest side, the less resistant surface having little effect on leakage.

Test results indicate that effective insulation is given, on the exterior, by any combination of good building paper with sheathing and siding or shingles. For the interior, plaster on wood or metal lath or on fiber board showed up well. It made little difference whether the sheathing under the building paper was butt-edged or matched, or whether shingles, bevel siding, or drop siding were used over the paper. In selecting the building paper, toughness was found to be the main consideration, as the effects of other qualities are nullified when paper is easily torn. The use of building paper under shingles was found to decrease air leakage at least 99 per cent over similar construction without paper. Tests made with fiberboard as sheathing showed air leakage many times that noted with lumber and building paper.

Straightened Channel Proposed as Mississippi Flood Solution

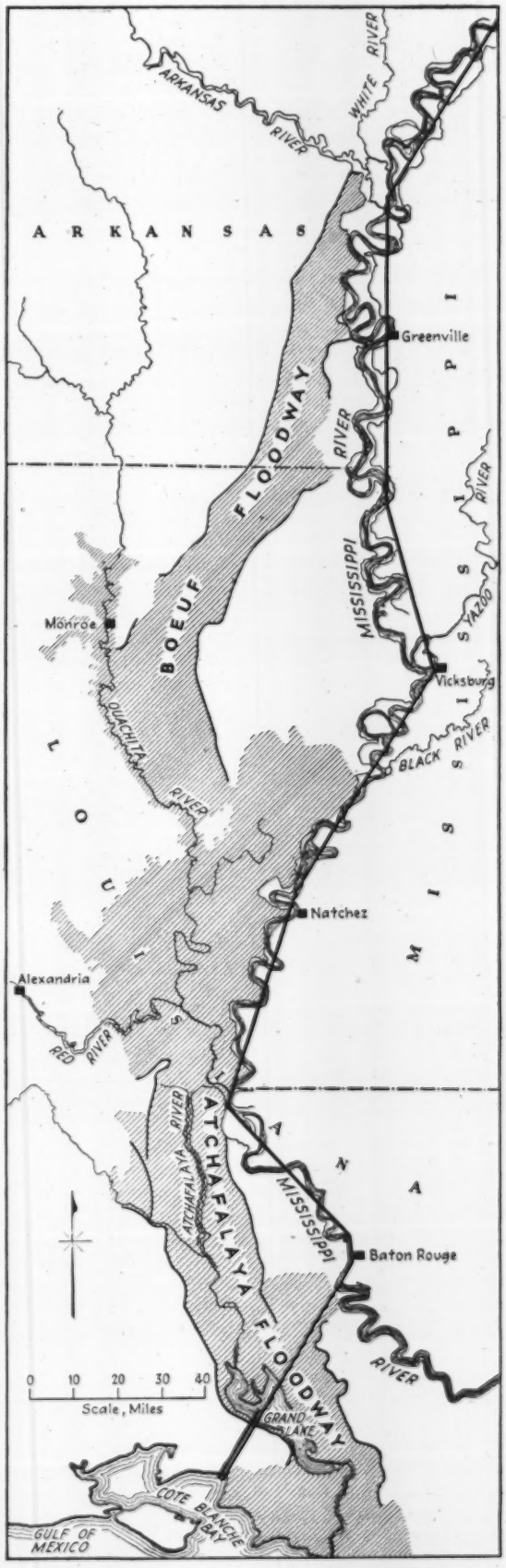
Lower Flood Stages and Minimum 21-Ft. Depth Claimed for Plan to Relocate River From Cairo to the Gulf

RECTIFICATION of conditions along the Mississippi River below Cairo, Ill., as respects both flood control and navigation, by the excavation of a new channel along a relatively straight alignment is the substance of a plan presented by Gardner S. Williams, consulting hydraulic engineer, to the American Engineering Council, at an informal meeting held Oct. 18 at Washington, D. C. A brief summary of the project was given in *Engineering News-Record*, Oct. 23, page 665.

In presenting his ideas Mr. Williams states that authorities in control of the Mississippi have always objected to any plan involving channel straightening on three grounds: (1) that the operation would destroy the regimen of the stream; (2) that the increased velocity resulting would be detrimental to navigation; (3) that the increased velocity would mean dangerous scour along the banks, particularly at bends. To the first of these, Mr. Williams presents the counter query, "Is the present regimen such that it should not be destroyed or replaced by another one?" To the second, regarding the effect of velocity upon navigation, the reply is that an increase in the velocity of the river, if held within reasonable limits, need not be a detriment, because the time lost by vessels ascending the stream would be gained on the return trip. If, in addition, the distance between points on the river should be materially shortened, the net result should be beneficial to navigation. In regard to the scouring effect of the water, the third objection, the answer is given that in the rectified channel proposed the maximum velocity for a flood over 10 per cent greater than that of 1927 is 8.31 ft. per second, a figure which has been exceeded on occasions during past floods without threatening the safety of the channel and its banks. It is further remarked that for the same velocity of current, the scour in a straight channel would be materially less than in a crooked one.

Details of the Plan

What is proposed is the excavation of an entirely new channel for the river, beginning at a point 10 miles below Cairo, Ill., and extending, by a series of long tangents, to St. Delphine Landing, La., about 9 miles by river below Baton Rouge, La. From this point the low-water flow would be discharged through the existing channel past New Orleans. In time of flood any quantity of water exceeding 1,250,000 sec.-ft. would be bypassed at St. Delphine Landing through a 50-mile excavated channel, with a carrying capacity of 1,750,000 sec.-ft., extending through Grand Lake to West Cote Blanche Bay, on the Gulf of Mexico. By this route the total distance from Cairo to the Gulf would be approximately 555 miles, as compared with the present river length of 1,065 miles. A separate and parallel channel from Grand Lake to the Gulf would be necessary to carry floodwaters of the Atchafalaya, Red and Black rivers, estimated at a maximum of 500,000 sec.-ft. These provisions would allow for a total discharge, at the mouth of the Red River, of 3,500,000 sec.-ft.; the maximum discharge during the flood of 1927 at the same point was 2,053,000 sec.-ft.



PROPOSED MISSISSIPPI RELOCATION BELOW MEMPHIS

Plans for the construction of the rectified channel provide two alternatives. The first is based on the low-water grade line from Cairo to the Gulf. The maximum velocity in this channel would be 5.33 m.p.h., and the maximum flood height would be not less than 7.6 ft. lower than experienced during the 1927 flood. As the amount of excavation required for this channel is necessarily greater than that required for a channel with a higher bottom, a second computation was made upon the basis of raising the flood line to 3 ft. below 1927 flood levels at Memphis and 1½ ft. above 1927 flood levels at Natchez. This channel provides a minimum low-water depth of 21 ft. and requires less than 75 per cent as much excavation. In both cases quantities are estimated for a parabolic channel section with the vertex down, thus insuring the flow of water along the same line regardless of depth.

In regard to costs, the plan submits no definite figures, although there is a general statement that its execution would cost between five and six times as much as was spent on the Panama Canal—in the neighborhood of two billion dollars. By far the greatest part of the expense would be for excavation and disposal of the material, but it would also be necessary to acquire rights-of-way wherever the channel departs from the area now between levees. This would amount to approximately 315,000 acres, of which about 200,000 appear to be under cultivation. There would also be about 55 miles of railroad relocation, 29 miles of track to be placed on bridges or trestles, and 65 miles of highway relocation, of which only about 10 miles is paved. Excavation is estimated at 25¼ billion cu.yd. for the deeper channel, or 18¾ billion for the higher.

Letters to the Editor

Costly Passenger Stations

Sir—Your editorial in the issue of Aug. 21 on "Costly Passenger Stations" is timely. Such stations not only fail to be economically justified by additional revenues or reduced operating expenses but, even worse, they result in a rate increment that does not accrue to the benefit of patrons but, instead, to the cities where the stations are built. Passenger business on the lines involved has never shown any appreciable permanent increase after the erection of a luxurious station, and actual operating economies in the way of reduced wages or otherwise have been negligible.

In many instances the elaborate station is choked by suburban passengers who need little more than a gateway and who make little use of the accommodations afforded. In fact, a station which would provide the necessary facilities of adequate capacity would probably be practically as productive of net revenues as the modern colossal station. Aside from air rights and concessions, advertising value and local good will constitute the principal returns to the railroad from costly passenger stations.

The benefits from the expensive station actually accrue chiefly to the cities in which the terminal is located, and more especially to real estate in the vicinity of the improvement. Adjacent hotel sites and business blocks are boosted, although no special assessment is made against them to help pay for the project which yields the gain.

Not only does this inequitable burden exist as to fixed costs but in operating costs—maintenance, depreciation and taxes—as well, and these items contribute heavily to the cost of service, on which rates, at least remotely, are predicated. With respect to taxes particularly these costs are rapidly mounting. Taxes on railway property since 1900 have increased six times as rapidly as has investment and now amount to about 6½ per cent of gross earnings. Local taxes, which chiefly account for this increase owing to prevailing high city taxes, have advanced about tenfold since 1900. This fact means that railroad patrons are paying for part of the operation of city government through a levy embodied in rates from which they receive no corresponding value in service. Even if the investment in city terminals were only what is economically warranted, most local taxes represent no return to a railroad beyond some protection (which occasions but a small fraction of the total tax levy) and the inequity is aggravated when the investment is excessive, as is the case in the type of passenger station under discussion.

Indeed, this discrimination has ramifications beyond passenger fares, since freight and other services must make up deficiencies in net passenger revenues if the railroad is to remain solvent. For this reason freight rates are indirectly influenced, notwithstanding the fact that railroad accounts separate most of the expenses between the two services. Therefore, it may be charged that all railroad tariffs carry an increment resulting from costly passenger stations for which patrons receive no return in service, and this situation makes the costly passenger station a source of unfairness as well as of doubtful economic propriety.

Iowa City, Iowa. C. C. Williams,
Sept. 2, 1930. Dean, College of Engineering,
State University of Iowa.

Automobile Accidents

Sir—When an experienced and skilled automobile driver runs his car along frequented streets and highways in cities and countries he often wonders why there are not far more accidents.

If one drives every day say 50 miles and never takes a chance of having an accident of more than one in a hundred but does this only once every day, theoretically he should have an accident every 100 days. Now, if we assume that in 100 actual accidents only one caused death, then the chance of killing himself or some one else any particular day would be one in 10,000, so that on the average he would have a fatal accident once in 27 years' constant driving.

A person who never takes a greater than one in a hundred chance would be looked upon as an extremely safe and conservative driver.

Apparently the streets have multitudes of drivers who are constantly taking much greater chances, and it is a mystery how they get away with it. J. W. Ledoux,
Philadelphia, Pa., Consulting Engineer.
Aug. 25, 1930.

Research in Groundwater Problems

Sir—Your editorial of Aug. 14 entitled "Drainage Lessons in Recent Construction" deserves careful attention by the engineering profession. It is my reaction to your editorial that the reason the engineer has not taken a more active part in the control of groundwater in excavation is because certain fundamentals of information are lacking. Possibly one of the most vital needs in practical application is more definite quantitative data regarding soil characteristics. Groundwater conditions are usually so complex that without such data one man's guess is as good as another's, and it has been left to the man on the job to do the guessing.

In design the engineer has at his command a wealth of accurate information regarding the strength characteristics of various materials as obtained in the testing laboratory. He may also draw upon the results of laboratory research in specifying materials with improved characteristics, such as alloys, protective coverings, etc. Those who have come into contact with groundwater, however, whether in connection with water supply, sanitation, land drainage or wet excavation, all feel the need for research work.

Fortunately, a start is being made along this line. A hydrologic laboratory has been maintained for several years by the groundwater division, water resources branch, U. S. Geological Survey, at Washington, D. C., in connection with the groundwater investigational work of this organization. More recently the Soil Mechanics Laboratory, Massachusetts

Institute of Technology, has been established as a result of the stimulating work of Dr. Charles Terzaghi. Other laboratories are also doing pioneer work, such as the Experimental Station of the Hawaiian Sugar Planters Association at Honolulu, and the Pacific Hydrologic Laboratory at San Francisco, recently established by the writer.

With increasing laboratory facilities and improvements in obtaining field samples of materials, there should be no reason for the engineer not taking responsibility in the control of groundwater in excavations.

CHARLES H. LEE,
Consulting Engineer.

San Francisco, Calif.,
Sept. 16, 1930.

Underpass Center Piers

Sir—I cannot refrain from answering the editorial in *Engineering News-Record* of Oct. 16 entitled "Underpass Center Piers." You state that the costs and standard practices seem to be the main arguments in favor of center piers in underpasses, and you make no mention whatever of any other reasons. One not familiar with any of the many other reasons for constructing underpasses with columns in the center of the streets would be led to believe by your editorial that column construction in the center of the highway at undercrossings is essentially dangerous and that there is no good argument whatever in favor of such construction.

My position as chief engineer of the Lackawanna Railroad for over twenty years has made it necessary for me to spend much time with the grade-crossing problem. I have negotiated many grade-crossing contracts and we have designed layouts and structures for the elimination of grade crossings under almost every conceivable arrangement. I am certain that in carrying out all of this grade-crossing work we have never permitted standard practice to govern with respect to either negotiation or design. Therefore one of the two reasons that you cite for center column construction does not apply on the Lackawanna work. We have used center-column construction in many cases, but with few exceptions and in all cases in recent years such construction has been with concrete bridges where little or no structural steel was used.

The cost, the other and only good reason cited in your editorial, is an important item and in fact so important that it cannot be ignored. We have had many cases where flat slab concrete bridges have been constructed for 50 per cent less than it would have cost to construct steel bridges of clear span, to say nothing of the added cost of higher elevation of the railroad or deeper depression of the street on account of the greater floor depth required with a steel bridge and the additional width of embankment and right-of-way required for the railroad. On what basis can you assume that this added cost for clear spans should not be considered, especially where the railroad is paying the large part of the bill? The Lackawanna has in the past eliminated practically all of the grade crossings on its main lines in New Jersey, and with few exceptions the construction cost has been entirely paid by the Lackawanna. If it is essential that clear span bridges be provided for all grade-crossing separations, then a greater proportion of the expense of such separation should be paid by the public and especially by those who use the highways with buses and trucks in competition with the railroads.

To give you an illustration on the matter of cost I present the following facts:

In 1926 the Lackawanna built a through plate girder bridge with a waterproofed solid ballasted floor for double track over a highway in New Jersey with a clear span between abutments of 86 ft. At the same time a reinforced-concrete flat slab structure was built over another highway, also in New Jersey, for four tracks. The length of this structure is 108 ft. 4 in. The distance between neat lines at right angles to the street is 70 ft. The width of the bridge is 59 ft. out to out of balastrades. Columns were placed on the curb and in the center of the street and each driveway is 20 ft. curb to curb. Both structures above referred to were built by the same contractor, the contracts being awarded on competitive bidding. The four-track concrete structure cost 37 per cent less than the two-track steel structure.

As I have stated, there are several items in addition to cost which must be considered in connection with this problem. At least a foot more height between the top of the roadway and the base of the rail is required for a steel structure than is necessary with the mushroom type of flat slab construction. The tracks must be spaced from 3 ft. to 4 ft. 6 in. farther apart with steel structures. Both vertical clearance and the additional width required may become a very serious matter in a thickly populated community where there are many street crossings. Where a depression of the highway is necessary the depression must be deeper and the approaches longer with a clear span construction. Center girders become a very great menace to employees on the railroad, and especially so at points where any switching is necessary. The flat slab construction makes it possible to keep track centers at 13 ft. and eliminates the hazard of center girders.

We have made an effort in all of our construction work to provide artistic structures. It is simply out of the question to make artistic structures out of steel overcrossings without going to unreasonable expense, and with no limit to the expense such bridges never can be made as pleasing to the eye as solid concrete structures. The flat slab concrete construction provides a roadbed just as noiseless as any other part of the railroad. Steel structures, even with heavy concrete floors, are not noiseless. At least in one town in New Jersey where we had nearly 40 grade crossings we were not able to make a contract with the municipality for the elimination of crossings until we would agree to provide concrete structures throughout.

It is my personal opinion that center piers save more accidents than they ever cause and where judgment is used in the design such piers are not a menace in the highway. On all important highways in thickly populated communities it is the general practice to hold traffic in lanes. In many places it is a misdemeanor for a driver to cross from one lane to an adjoining one. The only difference between the underpass with center columns and any other part of the road is the fact that vehicles must stay on their respective sides of the street. I would not have you understand that I advocate center columns in all underpasses. In the country districts where a fast highway speed is permitted a clear roadway span should be provided where at all feasible. On the other hand, within city limits or municipalities where highway speed is restricted, no good reason can be advanced for providing clear span bridges where such construction will add to the cost or detract from the appearance of the completed work.

Furthermore, at such intersecting crossings as Madison Ave. and Ridgedale Ave. in Madison, N. J., and Speedwell Ave. and Littleton Road in Morris Plains, N. J., the center columns which have been provided in these thoroughfares are a material assistance in regulating traffic, and the underpasses are far safer with these center columns than they would be without them.

G. J. RAY,,
Chief Engineer,
D.L.&W.R.R. Co.

Hoboken, N. J.,
Oct. 21, 1930.

Our comment was directed especially toward underpasses in country districts referred to in Mr. Ray's next to last paragraph.—EDITOR.

Siphon Failure in Alaska

Sir—In your issue of Sept. 25 you showed a photograph of a collapsed siphon in Alaska, due to vacuum forming inside of the 46-in. pipe. It is mentioned that the pipes were supplied with 1¼-in. screw plugs in each 30-ft. length. These plugs were probably larger, as the openings are used either for inserting of rivets or as air holes in pipes having circumferential seam field rivets.

To prevent accidents of this type the proper application of automatic air valves is all that is required and these should never be omitted.

GEORGE SOMMER,
Secretary and Treasurer,
New York Engineering Co.

New York City,
Sept. 27, 1930.

News of the Week

Reinforcing Steel Institute Reports Satisfactory Year

AT THE semi-annual meeting of the Concrete Reinforcing Steel Institute held at Briarcliff Lodge, Westchester County, N. Y., October 20-22, stabilization, promotional and technical developments, and customer relations comprised the main subjects on the program. About 75 members and guests were in attendance. Forty-one bar fabricators are now members of the Institute, according to M. A. Beeman, secretary.

C. Louis Meyer, of the Concrete Engineering Company, Omaha, president of the Institute, delivered an optimistic address. Dues from members during the first eight months of the year are slightly in excess of the same period of last year. Decline in sales of reinforcing bars compared with last year has been negligible, tonnage reports for the first eight months of the year showing a decline of only 5 per cent from the same period of last year. Shipments of reinforcing bars during the same period show an actual increase of 2 per cent. Mr. Meyer called attention to the column tests at Lehigh University which the Institute is helping to finance. The use of a quality mark for billet steel reinforcing bars is also looked upon as a forward step and an effective means of protecting the industry against the use of inferior steel. The most important problem of the industry is market stabilization. "The competitive problem," said Mr. Meyer, "usually increases as the available volume decreases. In our industry the most serious competitive problem today is undoubtedly that of direct mill competition. Stabilization of bar mar-

(Continued on p. 706)

Army Engineers Deny Delaying Flood Control Work

The following statement was issued by the U. S. War Department at Washington on Oct. 24:

Reports that contracts for work on the Mississippi and Missouri rivers are being held up in Washington, thereby causing the lay-off of men hired by contractors for furnishing piling, are in error. There are no contracts held up in Washington. The Chief of Engineers states that all matters involving labor are handled with the greatest dispatch with a view of keeping as many men as possible in employment.

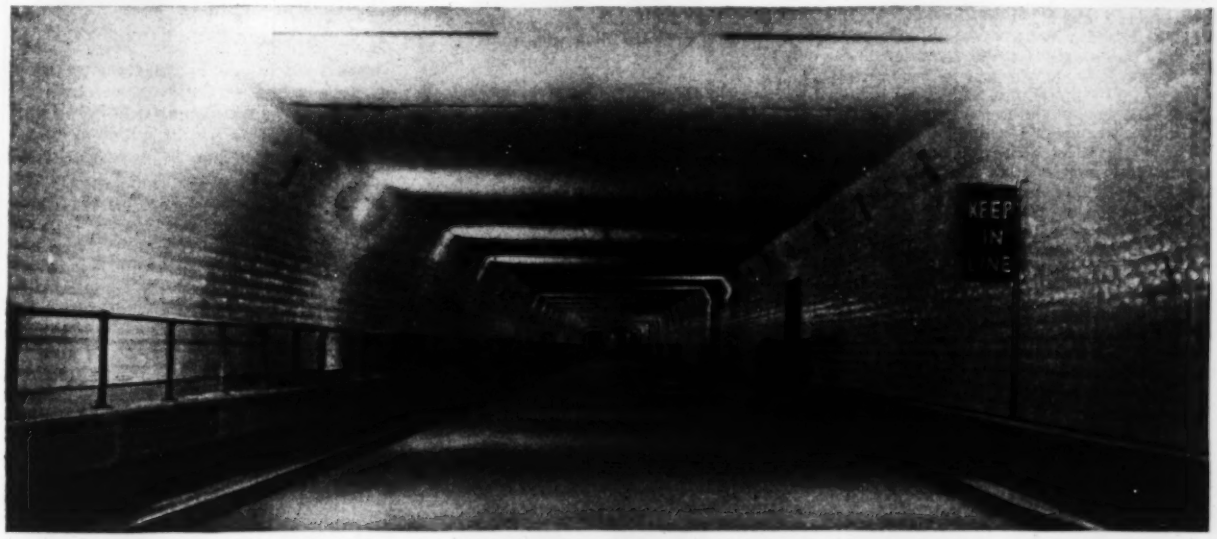
Means Suggested for Minimizing Risk at Boulder Canyon Dam

IN AN effort to work out a form of contract for the construction of the Boulder Canyon dam that will not result in excess cost to the United States, nor in excess profits nor excess risks to the contractor, Walker R. Young, construction engineer in charge of the project, has made the following suggestions relating to the proposed contract:

All materials which will become a part of the finished structures will be furnished by the government, eliminating uncertainties regarding cost of these materials.

All hazards in connection with diverting the river will be assumed by the United States. The diversion tunnels will be of large capacities, in fact, very much larger in proportion than are usually provided in the construction of dams. If they fail, contrary to ordinary procedure, the government will stand the loss and the contractor will be paid for their reconstruction.

A mosaic map of an extensive area in the vicinity of the dam site, as well as excellent topography, has been secured. This gives the contractor complete information relative to the character of the country in which the work is to be performed. It



FIRST INTERNATIONAL VEHICULAR TUNNEL READY FOR TRAFFIC NOV. 1

The new single-tube two-lane vehicular tunnel connecting the business districts of Detroit and Windsor, Ontario, will be opened to traffic November 1. An estimated capacity of 1,000 cars per hour in each direction can be handled by the 22-ft. roadway. The tunnel, described fully in *Engineering News-Record*, Oct. 17, 1929, p. 600, is 5,135 ft. from portal to portal, consisting mainly of one 220-ft. and eight 248-ft. tubes sunk for the underwater section; a 446-ft. shield-driven approach on the United States side and a similar approach 1,136 ft. long on the Canadian side. The shield for driving the approaches was 32 ft. 3½ in. in diameter, the largest ever used. A feature of the shield driving was the use of stamped steel liner plates. The tunnel was built as a toll project at a cost of $25,000,000 by the Detroit and Canada Tunnel Co. Parsons, Clapp, Brinckerhoff & Douglas were consulting and designing engineers. Parklap Construction Co., Porter Bros. & Robert Porter, and Northern Construction Co. were the contractors on the principal portions of the tunnel and approaches.

provides maps from which he can accurately estimate quantities and on which he can lay out his plant.

Hydrographic data over a period of a great many years has been assembled from which he can obtain information regarding the probable discharge of the river and therefore the works that will be necessary for the protection of his plant. A gaging station has been established in Grand Canyon which will serve to warn him of any impending danger from up the river.

Foundation conditions have been developed thoroughly at the dam site by extensive diamond drill operations. As a result the depth to bed rock and the character of material to be excavated are accurately known.

The government will assume the responsibility of selecting the sand and gravel pit, thus eliminating any hazard in that direction.

A construction railroad and highway to the dam site will be furnished by the government in advance of the beginning of operations and, in addition, the government will supply electric energy at the dam site at specified rates, thus eliminating any uncertaintities to be assumed by the contractor in the preliminary work.

Townsite facilities will be made by the government, including public utilities at specified rates.

Financial Arrangements

It has been the usual practice to require contractors to furnish bond in the amount of 50 per cent of the contract price. If this procedure is followed in the construction of Hoover dam and power plant it will be difficult for the contractor to secure a bond and the situation would be helped considerably if a bond in a smaller amount were required.

The situation would be relieved further if it were stated definitely in the contract that payment on progress estimates would be made in full after a reasonable holdback has been built up, provided that the work to date has been done in a satisfactory manner. In the case of the Hoover dam and power plant estimated to cost in the neighborhood of $100,000,000, a $2,500,000 holdback would provide ample margin of safety from the government's point of view, in that it would protect the interests of the government in the event of the contractor's failure. This amount of the holdback would be two and one-half per cent in place of the customary ten per cent, but the total holdback of $2,500,000 should be built up by holding back ten per cent of the progress earnings until the holdback has been built up to its total amount.

The contract might be drawn to provide annual adjustments in unit contract prices for equipment, supplies and labor. In a specified ratio between an index figure for the prices of material and labor for the year in which the contract was signed and for each succeeding year thereafter, the index figure adopted should be furnished by a national agency, possibly the Departments of Commerce and Labor, and the ratio should be fixed on the proportions of value of the commodities in question in the contract unit prices.

If the above plan were adopted a differential should be established whereby any increase would be borne in part by the United States and in part by the contractor to prevent higher prices being paid by the contractor than were necessary in comparison with the ruling markets. Likewise, in the case of the reduction below the original index the United States would share in the resultant saving. As an example, this differential might be fixed at a 75 per cent share for the United States and a 25 per cent share for the contractor in which case any increase in the price of contractor's equipment, supplies and labor would be borne by the respective parties in that proportion. Likewise, any decrease would accrue to the benefit of the respective parties in the same proportion.

Mr. Walker is outspoken in his objection to a cost-plus contract. "If it is desired to do the work on a cost basis," he states, "there appears to be no good reason why it should not be done by government force account. The bureau's record of past performance demonstrates its ability to do construction work efficiently and economically."

Business Leaders Visit Research Laboratories on 9-Day Trip

Under the auspices of the National Research Council, a party of 85 industrial executives and bankers recently completed a 9-day trip to some of the leading research laboratories in the Eastern section of the United States. Starting at New York City on Oct. 7, the group first inspected the Bell Telephone Laboratories and then visited, successively, the following: General Electric Co., Schenectady, N. Y.; General Motors Research Laboratories and proving ground, Detroit; engineering division, U. S. Air Service, Dayton, Ohio; American Rolling Mills Co., Middletown, Ohio; Aluminum Company of America, New Kensington, Pa.; Mellon Institute of Industrial Research, Pittsburgh; U. S. Bureau of Standards, Washington, D. C., and National Canners' Association, Washington. During the stop at Dayton some of the party visited the dams and flood protection works of the Miami Conservancy District. A stop was also made at the Washington office of the National Research Council.

Contract Let for Salvage of Vancouver Bridge Span

Directors of the Burrard Inlet Tunnel & Bridge Company, owners of the Second Narrows bridge at Vancouver, a span of which was swept away by the log-carrier "Pacific Gatherer," on Sept. 19, have accepted a joint offer of the Pacific Salvage Co. and the Burrard Drydock Co. to raise and replace the 300-ft. span on a time and material basis at a price not to exceed $170,000. Work will commence at once. A clause in the contract provides that if the work is finished on time at a cost of less than $150,000, the bridge company will pay the contractors 50 per cent of the difference between the actual cost and $150,000. As soon as the span is raised, the Dominion Government will be asked to appoint an inspector to report on the advisability of using the old span. If this cannot be done, the bridge company agrees to pay the salvors $20,000 plus $150 per day while the span is on drydock.

An account of the destruction of the span was given in *Engineering News-Record*, Sept. 25, p. 507.

Injunction Proposed in Missouri Floodway Dispute

Apparently displeased with the delay of the Federal Government in paying into court money for judgments to property owners affected by the construction of the setback levee between Bird's Point and New Madrid, Mo., United States District Judge Charles B. Faris at Cape Girardeau, Mo., on Oct. 21 indicated that he may be forced to enjoin the federal government from proceeding further with the levee construction until the money is produced. Judge Faris pointed out that he has the right to halt the levee construction unless the orders of his court are complied with. He will wait until the end of this term of court, to be concluded shortly, when he is expected to take definite action to force the payment of judgments awarded by the court.

New Gas Line to Florida

A natural gas pipe line linking Florida with the Louisiana gas fields has been authorized by the Southern Natural Gas Corp., and work on it will be begun soon. The line, which will be 67 miles long and will pass through 10 miles of swamp land in Alabama and cross the Tensas and Mobile rivers, will be built by the Natural Gas Engineering Corp. The line will consist of 12¾-in. acetylene-welded pipe, and will connect with the company's main line near Mobile, Ala., and run to Pensacola. It will cost about $1,000,000.

Engineering Foundation Appoints Committee on Education

Steps to promote engineering education were taken at the regular meeting of the Engineering Foundation held Oct. 16 in New York City, at which the appointment of a committee on educational research was announced. This committee is expected to ascertain the attitude of the societies it represents and to find out what specific activities can advisedly be undertaken under the auspices of the Engineering Foundation, recommending a definite program. It is headed by Dr. Harvey N. Davis, president of Stevens Institute of Technology, representing the American Society of Mechanical Engineers. Other members and the societies which they represent are: Prof. William B. Plank, mining department, Lafayette College, the American Society of Mining and Metallurgical Engineers; Prof. Harold B. Smith, Worcester Polytechnic Institute, American Institute of Electrical Engineers; R. I. Rees, assistant vice-president, American Telephone and Telegraph Co., Society for Promotion of Engineering Education; Prof. Alfred H. White, department of chemical engineering, University of Michigan, American Institute of Chemical Engineers; Robert E. Doherty, consulting engineer, Engineering Foundation. A representative of the American Society of Civil Engineers has not yet been designated.

Large Irrigation Project Started in Texas

Construction of one of the largest irrigation projects in Texas, involving an expenditure of $7,000,000, for which bonds have already been issued and sold, is in progress near Eagle Pass. The area to be irrigated adjoins the Rio Grande. The main canal intake will be 40 miles above Eagle Pass and the water will be brought to lands situated adjacent to the town. The main contract was awarded to Bart Moore, Inc., of San Antonio, and the contract for smaller structural work, including culverts and pipe, was given to Field & McElvy, of Lubbock, Tex. In addition to the reclamation of 60,000 acres of land, the gravity flow of the canal will be used to generate electric power. The bonds which have been issued provide for the construction of a large hydroelectric plant which will be taken over and operated by the Central Power & Light Co.

Railway Bridge and Building Practices Discussed

Comparative costs of concrete crib retaining walls (built of precast units) and monolithic walls were reviewed in one of the masonry reports presented at the annual meeting of the American Railway Bridge and Building Association, held at Louisville, Ky., Oct. 21-23. Figures of cost per square foot of face ranged from $1 to $3.20 for crib walls 5 to 16 ft. high and from 72c. to $7.33 for solid walls 5 to 20 ft. high. In a case where detailed estimates were made for the two types the totals were $79,300 and $128,000 for crib and solid walls respectively. No reference was made to different forms of crib construction, but the committee recommended serious consideration of this type, especially for walls up to 12 ft. in height. Causes of failures of stone and concrete masonry were dealt with in another report which showed that stone masonry needs attention to its pointing and drainage in order to keep it in good condition. Several methods of repairing concrete were described.

Welding, as applied to bridge work, was the subject of a paper by Albert Reichmann, division engineer of the American Bridge Co., while its specific application in strengthening the Des Moines River bridge was described by W. R. Roof, bridge engineer of the Chicago Great Western Ry. Of two reports on inspection and maintenance methods, one dealt with turntable and bridge machinery and the other with tanks and water-service equipment. The economic and practical advantages of programming maintenance work were summarized in a brief report which showed that many roads follow this system to a greater or less extent.

That comfortable and well equipped camp cars for bridge and building crews are surely, though slowly, replacing the old and dilapidated box cars so generally assigned to this service was shown in a report giving numerous examples. These indicated the advantages in assisting to maintain practically permanent forces of experienced and satisfied men. Along somewhat similar lines was a report on power tools and equipment, with the economy of their use. A report on modernizing station buildings of the smaller class included exterior casing of frame structures with brick or stucco and also interior alterations for appearance, convenience and sanitation.

The president, elected for 1930-1931, is C. S. Heritage, bridge engineer of the Kansas City Southern Ry. The secretary, re-elected, is C. A. Lichty, Chicago & Northwestern Ry., Chicago.

Bids Requested on Railway Tunnel in Vancouver, B. C.

The Canadian Pacific Railway has invited bids from a selected list of contractors for the construction of a 4,600-ft. tunnel under the downtown district of Vancouver, B. C. The tunnel will eliminate present grade crossings at six busy city streets, and will connect the C.P.R. right of way on Burrard Inlet with its False Creek yards. Bids must be received by noon of Dec. 1. Cost is estimated at approximately $1,750,000. The contract will call for a tunnel 22½ ft. high varying in width from 16 to 19 ft. Contractors are also asked to figure on a 2-ft. concrete lining with which the roof and sides will be reinforced throughout its entire length. Recent core borings reveal that the strata ranges from sand to rock.

The Business Outlook

Undismayed by the indecision of business leadership, financial conservatism, and the confusion of political cross-currents here and abroad, the fundamental though blind forces of human needs are again slowly laying the basis for future recovery. The mass of final buyers are more keenly alive to bargain values offered by energetic merchandisers than are manufacturers who are offered the lowest raw material prices in many years. Consumption eats steadily into supplies as industrial production lags. Commodity prices in recent weeks have tended to hold up against the deflation process still under way in securities. As these fundamental forces become more apparent, business is beginning to reconcile itself to the fading hope of any decisive large-scale action toward recovery from above, and is realizing the necessity of aggressive individual action from the bottom.

—The Business Week, Oct. 20.

Natural Gas Pipe-Line Completed to Albuquerque, N. M.

Construction of a 138-mile pipe line bringing natural gas to Albuquerque, N. M., from the San Juan basin has been completed by The Southern Union Gas Co. This pipe line, together with the 55-mile branch line from Santa Fe, represents an expenditure of approximately $5,000,000. Plans are being made for distribution through the present mains, owned by the Albuquerque Gas & Electric Co.

Pennsylvania Contractors Complete Ten Years of Association

This October marks the end of the first ten years of existence of the Associated Pennsylvania Constructors, the official state branch of the Associated General Contractors of America. It was on Oct. 30, 1920, that the association was formally launched with a charter membership list of 42 contracting concerns. As now constituted, the body is composed of both individual and chapter members throughout Pennsylvania, with branches established at Philadelphia, Pittsburgh, Allentown, Scranton and Wilkes Barre. In addition to the usual scope of constructor activities, including a general service bureau, the association conducts a state-wide accident prevention plan in charge of a safety expert, a traffic bureau, a legislative bureau and a state-wide quantity survey service. The report of its present committee on contracts and specifications was the basis upon which negotiations were carried on by the A.G.C., the American Association of State Highway Officials and other organizations leading to the introduction of various principles of contract equity and the revision of specifications in connection with highway construction. The Pennsylvania organization has also played a leading part in establishing the principle of prequalification.

State Board Council Approves Uniform Registration Law

Official endorsement of the uniform registration law for professional engineers and land surveyors was given by the National Council of State Boards of Engineering Examiners at the eleventh annual convention, held in Richmond, Va., Oct. 20-21. This law is that compiled by a committee of the American Society of Civil Engineers in collaboration with committees from a number of other organizations, including all founder societies, the American Engineering Council and the American Association of Engineers.

A total of 30 delegates were present, representing 16 states, the American Society of Civil Engineers, the American Association of Engineers, and the American Engineering Council. Other topics considered at the meeting were:

"The Status of Landscape Architects in connection with Registration of Engineers," the codification of registration laws, and the reports of several committees. Two important committees were appointed, one to draft a suggested system of reciprocity in connection with the registration of engineers, headed by L. M. Martin, of Iowa; the other to investigate and compile suggested uniform examinations to be used by the various state boards for the registration of engineers. D. B. Steinman, New York City, is chairman. Both committees will report at the next annual convention, to be held in Detroit, Mich.

Officers elected at the convention were as follows: President, T. Keith Legaré, Columbia, S. C.; vice-president, D. B. Steinman, New York City; secretary-treasurer, Dean P. H. Daggett, Rutgers University.

Brief News

U. S. Civil Service Commission is receiving applications for the post of geologist on reservoir and dam site investigations until Nov. 26. The entrance salary is $3,800.

Phoenix, Ariz., is planning to begin construction of a water and sewerage system about Jan. 1, 1931, as the result of the sale of a $3,422,000 bond issue for this purpose.

Use of Insulation in the construction of the roof of the new building in Washington of the Bureau of Internal Revenue was so effective during the unusually warm summer that orders have been issued to insulate the roofs of the other buildings in the government program.

An Interest-Free Loan of $50,000 has been offered to the city of Hagerstown, Md., for the expansion of public works to relieve unemployment by the Pangborn Corp., of that city. The loan is conditioned upon the raising of an additional sum of at least $200,000, to be supplied by other private interests under the same conditions.

Water Supply for Boulder City will be taken from the Colorado River, Reclamation Bureau engineers have decided. This will involve the installation of filtration and treatment plants. Efforts to obtain a domestic water supply from wells were not successful, due to the failure to find water sufficiently free of acid content.

Two Towns in New York State have already taken advantage of the highway sidewalk act which went into effect last April, providing that the cost of sidewalks along state roads may be allocated 65 per cent to the county and 35 per cent to the township. This relieves property owners along the road of the heavy assessments for sidewalks once charged against them. The town of Hague, on Lake George, has already submitted plans for state approval, and the town of Colonie, between Albany and Schenectady, will soon do so.

Reinforcing Steel Institute

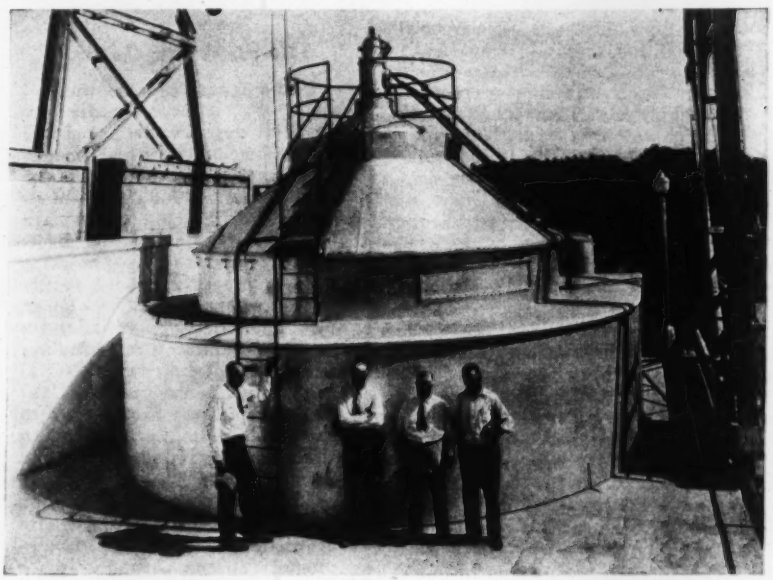
(Continued from p. 703)

kets has been fairly well accomplished in those localities where the competitive influences are confined to reinforcing bar fabricators.

The progress being made in promoting intermediate grade steel was discussed by A. E. Lindau. He also reported that the Department of Commerce will soon issue a revised simplified practice recommendation in which all bar areas will be expressed in two decimal places instead of three, in accordance with the Institute's recommendation. It is believed that the relative percentage of the use of intermediate grades, which was about 87 per cent in 1929, will not be greatly changed for 1930. Mr. Lindau said that to his committee's knowledge there are three railroads, three state highway commissions, two subway boards, one city board of public works, one city school architect, one city building code and approximately twenty private engineers whose specifications do not allow intermediate grade steel. However, these authorities in 1929 required almost equal amounts of structural and hard grade steels so that the Institute's intermediate grade is seen as a compromise between these two extremes. At a later time in the session Mr. Lindau spoke of the difficulties with the present tolerance limits. It seems that 5 per cent tolerance in weight, the present requirement, is satisfactory for a large bundle of bars. Many buyers, however, want each bar within the tolerance. Rolling mills say that a bar 70 to 90 ft. long will vary 5 per cent or more throughout its length, which would indicate greater tolerance may be necessary.

O. W. Irwin, Truscon Steel Co. chairman of the committee on standard practice, reported that the A.S.T.M. in revising its billet steel specification had adopted the Institute's recommendations for mill marking and heat identification. This committee recommended that efforts be made to discourage bar detailing by engineers in Baltimore, Kansas City, St. Paul, Minneapolis, St. Louis and Chicago.

A paper by N. R. Patterson, of the Patterson Steel Co., Tulsa, Okla., was read under the title of "Better Residence Construction in Oklahoma City." It told of the organization of a "better homes construction bureau" by real estate loan organizations in the city in an attempt to govern and regulate loans by supervising design and construction methods and making loans only on approved buildings. There is no cost to the home builder, and the paper reported considerable salutary effects from the practice. Hugh J. Baker, of Hugh J. Baker & Company, Indianapolis, talked on "Promotional Problems and Future Markets," recounting the history of reinforced concrete development, and listed a number of promotional activities which reinforcing steel fabricators, both individually and as members of the Institute, may profitably undertake. An interesting and entertaining talk along a similar line of thought was given by Stanley G. Cutler, vice president, Olney J. Dean & Company, Chicago.



STEEL HOOD PROTECTS GENERATOR FROM WEATHER

This 4,580-hp. outdoor generating unit at the Merced Falls plant of the San Joaquin Light & Power Corp. Fresno, Calif., is protected from the elements by a welded steel hood, made up of 21 pieces of steel plate. The rolled edges are formed by welding the plate edges to pieces of split pipe. Shutters for the control of ventilation are operated by the handles around the upper circle and just below it. Louvres appear at the top of the steps. Extending through the top of the unit are pipes which carry oil. This flows down the hollow shaft to the servomotor within the shaft which adjusts the blades.

Readjusted Compensation for New York Barge Canal Workers

Claims aggregating between $4,000,000 and $5,000,000 have been filed with the New York state court of claims under the recent act of the legislature authorizing Barge Canal workers, employed during the period immediately after the World War, to sue for the difference between the wages paid them and those prevailing in the localities where they were employed. More than 2,000 claims have been filed, the sums asked ranging from $200 to $20,000. Sept. 15 was the last day for filing such claims. The court of claims will start hearing them at Syracuse on Oct. 6.

A test case was carried to the court of appeals last year and the state's highest court ruled that the law is constitutional. Two years ago the legislature first authorized the claimants to bring suit, but thousands failed to take advantage of the opportunity. For that reason another law was passed last winter extending the time limit until Sept. 15, 1930. The workers include carpenters, electricians, locktenders, gatekeepers and mechanics of various kinds.

To Honor X. H. Goodnough

Engineers and sanitarians in the vicinity of Boston, Mass., are preparing to tender a complimentary dinner to X. H. Goodnough, whose retirement as chief engineer and director of the sanitary engineering division of the Massachusetts State Department of Health was announced in *Engineering News-Record*, Oct. 23, p. 667. Mr. Goodnough's actual retirement took place on Oct. 23, his 70th birthday, in accordance with the state law requiring retirement at this age. The dinner, which will be held Nov. 13, is in charge of a special committee headed by Charles W. Sherman, of Metcalf & Eddy, consulting engineers, Boston.

Final Payment on Diablo Dam Made by Seattle

The utilities and finance committees of the Seattle, Wash., city council have granted an additional $500,000, as requested by City Engineer R. H. Thomson, to be complete payment for Diablo dam. With the $500,000 in bonds that was recently granted, the cost of the dam is thus increased $1,000,000 over the original estimate of $3,500,000. Money will be appropriated from the construction fund of the city council. The grant will be used to pay for additional engineering, machinery, supplies, and extra compensation claims of Winston Bros. Co., Minneapolis contractors, who built the dam.

Recommendation that the city refuse a claim for $2,000 royalty filed by attorneys for the Smith water stop, used in guarding the dam from leakage, has been made by Frank J. Laube, chairman of the finance committee. R. H. Thomson, city engineer, recommends that the city allow the claimants to bring suit, pointing out that it would then be up to the courts to decide whether the Angle Arch Dam Co., designers of the dam; Winston Bros. Co., builders, or the city, which specified the use of the stop, is to be held responsible for the payment of royalty.

Traffic on New York Barge Canal

With a total of 2,970,930 tons carried on the New York State Barge Canal up to Oct. 18, and six weeks of navigation still remaining, all indications point to 1930 as the greatest traffic year on the waterway since it was enlarged in 1918. The figure just given is 94,770 tons greater than the total amount of traffic in 1929; canal officials expect to reach a new mark this year of 3,500,000 tons.

Plans for 3,600-Ft. Viaduct Across Los Angeles River

Completed plans for construction of the Sixth St. viaduct, longest and costliest of the spans across the Los Angeles River, will be ready Jan. 1, 1931, according to Merril Butler, structural engineer, Los Angeles city engineering department. The viaduct will cost approximately $2,500,000. It will be 3,600 ft. long and have a roadway between 46 ft. and 56 ft. wide. Preliminary work, involving construction of three pier foundations in the river bed and a tunnel undercrossing for a proposed truck boulevard on the west bank of the river, is now under way and will be completed shortly.

Works Starts on Large Hydro Plant in Ontario

Work has been started on the construction of a hydro-electric power plant in the canyon of the Abitibi River about 65 miles north of Cochrane, Ont. A gravity-section concrete dam will be built across the canyon and will be flanked on each side of the valley by earth embankments extending back to higher land. The power house will be built at the toe of the dam down in the canyon. A head of 237 ft. is to be developed, and the power house is being laid out to provide for five generators of 55,000-hp. capacity. Power is to be generated at 25 and 60 cycles, the 25-cycle power to be sold under contract to the Ontario Hydroelectric Power Commission. Above the canyon site the Abitibi River has a drainage area of 8,400 square miles and possible storage area of 420 square miles.

The power site is being developed by the Ontario Power Service Corporation, which has let the contract for the construction of the dam and power house to the Dominion Construction Co., of Montreal. The engineering work is being done by George F. Hardy, consulting engineer, New York, and W. B. Crombie is resident engineer.

WASHINGTON NOTES

By Paul Wooton
Washington Correspondent

Congress to Be Asked for Cash for Roads — Plan Survey of Motor Truck Operating Costs

LEGISLATION proposing that the road money allotted Sept. 1 be made immediately available will be introduced at the opening of the December session of Congress. Reports to the Bureau of Public Roads are to the effect that a few states are prepared to absorb next year's money, but the chief benefit of having allotted the money, it is pointed out, is that it has speeded up the use of the money already appropriated. Knowing that the funds formally allocated to the several states constitute a contractural obligation of the United States, the state highway commissions have felt justified in spending available money on old projects, since additional money for new projects is assured.

Total expenditures for road working during the calendar year of 1930 will approximate $1,700,000,000. As 75 per cent of the total is roughly calculated as the proportion going for salaries and wages, it is contended that the road program has been doing its full part in providing employment in this year of depression. The rate of expenditure is practically certain to continue to increase, it is declared at the bureau, as the demand for roads seems to increase faster than they can be constructed.

Flood Control and Employment

Before making public his comment on suggested changes in the Jadwin flood control plan, Secretary of War Patrick J. Hurley stated last week that he will submit his recommendations to the House flood control committee. The army engineers have completed their restudy of the plan and have sent their report to the Mississippi River Commission, as required by the flood control act. As soon as Congress convenes in December Secretary Hurley will endeavor to come to an understanding with the flood control committee as to what, if any, changes should be made in the existing project.

Although it is part of the administration's program for the relief of unemployment to provide additional jobs by stimulating river improvement and flood control work, Secretary Hurley does not believe that the suggested changes in the Jadwin plan will be of any considerable importance in affording more employment opportunities. However, in addition to speeding up operations by obtaining the immediate use of further appropriations, Secretary Hurley believes that much can be done in an administrative way toward stimulating employment by means of the flood control work. He intends to call on the contractors engaged in the work to cooperate with the government in relieving unemployment by rotating jobs. In this manner the men would work

shorter hours and for fewer days a week, thereby making it possible for each job to support several wage-earners. While the contractors cannot be compelled to rotate jobs it is believed that they will be glad to cooperate with the government in this respect.

Trucking Survey Starts

Field contact work in the Commerce Department's survey of motor truck operations will be started in the near future. It is expected that the field work will be completed by Jan. 1 and that the results of the study can be tabulated by spring. The survey is being made jointly by the transportation division of the Commerce Department and the Bureau of Public Roads. The main purpose is to show the extent of truck operations throughout the country and the relationship between the operation of these vehicles and highway construction and maintenance.

A preliminary survey was conducted last summer when 3,200 questionnaires were sent out. From the material gleaned from these questionnaires, printed forms have been prepared which will be taken to the truck operators by the government field men. After going over the returns received from the preliminary questionnaires, those in charge of the survey have selected 500 operators to whom they will send the field contact men.

Information is being compiled as to operating costs, number of vehicles operated, taxes and license fees, and the weight of vehicles used. In the highway end of the study, facts will be compiled as to the types or road over which the vehicles operate. The study is limited to common and contract carriers.

Personal Notes

HAROLD C. FISKE, colonel, corps of engineers, retired, has been appointed division engineer with the Board of Transportation, New York City, and will be at the head of the newly formed bureau of personnel of that department.

P. E. JARMAN has been appointed city manager of Westmount, Quebec. Mr. Jarman has been on the Westmount engineering staff for 22 years and has been city engineer since 1913. PERCY D. DELGRADO succeeds him as city engineer.

H. E. WESSMAN has left his position as associate professor of civil engineering at Nanyang University, Ministry of Railways, Shanghai, China, and has returned to New York City, where he is associated with Waddell & Hardesty, consulting engineers, as structural engineer.

HARVEY A. HALL, formerly with the Florida state road department and the University of Florida, is now office assistant in the U. S. Engineer Office at West Palm Beach, Fla. This office is directing the deepening of the Intracoastal Waterway between Stuart and Fort Lauderdale, Fla.

A. H. ARMSTRONG, for many years assistant engineer of the railway department, General Electric Co., and more recently chairman of the railroad electrification committee and consulting engineer for the transportation department, retires from the company on Nov. 1 to establish a private consulting engineering office in Schenectady, N. Y. Mr. Armstrong entered the employ of the Thomson-Houston Company at Lynn, Mass., upon graduation from Worcester Polytechnic Institute in 1891. He joined the railway engineering department of the General Electric Company in 1897. During his career he has been intimately connected with such electrification work as the Chicago, Milwaukee & St. Paul and Pacific, the Butte, Anaconda and Pacific, and the New York Central.

ROMEO R. MARTEL has been made professor of structural engineering at the California Institute of Technology, Pasadena, Calif. Mr. Martel has been at the Institute since 1918, successively as instructor, assistant professor, associate professor and professor of civil engineering. He represented the Southern California Council on earthquake protection at the third Pan-Pacific Science Congress, Tokyo, 1926, and also attended the World Engineering Congress in Tokyo in 1929 as representative of the California Institute of Technology.

Obituary

W. NEWELL WADE, senior civil engineer with the Massachusetts Department of Public Works, died Oct. 21 at his home in Newton, Mass. He was in his 59th year.

GEORGE M. SMITH, JR., 53 years old, for years a general contractor in Indianapolis, Ind., recently died of heart disease at his home in that city.

W. L. WEBB, formerly district engineer of the Chicago, Milwaukee, St. Paul & Pacific Ry., who retired in 1926, died at Elgin, Ill., Oct. 13, at the age of 76. Mr. Webb was born at Dover, Mo., and graduated from Washington and Lee University. After a few years on the jetty work at the South Pass mouth of the Mississippi River he went to the Atchison, Topeka & Santa Fe Ry. in 1879 and then to the Chicago, Milwaukee, St. Paul & Pacific Ry. in 1886, remaining with the latter road until his retirement.

HENRY MARTYN MACKAY, dean of the faculty of applied science and professor of civil engineering at McGill University, Montreal, died Oct. 25 in his 63d year. After working for the Department of Marine in Ottawa from 1894 to 1897, he taught mathematics at Pictou Academy, and then entered McGill as assistant professor of civil engineering 26 years ago. He has headed the faculty of applied science since 1924. Besides being a member of the advisory board of engineers on the Montreal harbor bridge, he had been in charge of construction of more than 100 bridges in Mexico for Waddell & Hedink, consulting engineers, of Kansas City. Born in Nova Scotia in 1868, Dean Mackay was educated at Pictou Academy, Dalhousie University and McGill. He was a member of the American Society of Civil Engineers, the Engineering Institute of Canada, and the National Research Council of Canada.

Society Calendar

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Washington, D. C.; annual meeting, Pittsburgh, Pa., Nov. 17-20.

AMERICAN ROAD BUILDERS ASSOCIATION, Washington, D. C.; annual convention and road show, St. Louis, Mo., Jan. 10-16.

ASPHALT PAVING CONFERENCE, New York City; ninth annual conference, Memphis, Tenn., Dec. 1-5.

NATIONAL ASSOCIATION OF RAILROAD AND PUBLIC UTILITIES COMMISSIONERS, New York City; annual meeting, Charleston, S. C., Nov. 12-15.

AMERICAN ENGINEERING COUNCIL will hold its regular annual meeting at Washington, D. C., Jan. 15-17, 1931.

INTERNATIONAL ACETYLENE ASSOCIATION will hold its 31st annual convention in Chicago Nov. 12-14. The major portion of the program will be devoted to oxyacetylene welding and cutting, and special sessions have been arranged on the metal-working industry, building construction, building piping and the distribution of oil, gas and water. A. C. Morrison, 30 East 42d St., New York City, is secretary.

IOWA SEWAGE TREATMENT CONFERENCE will hold its twelfth meeting at the Iowa State College, Ames, Iowa, Nov. 13-15, in conjunction with the Iowa Wastes Disposal Association, which will have charge at one of the sessions. The other sessions will deal with (1) fundamentals of sewage treatment, (2) operators' problems, and (3) treatment plant difficulties.

LOS ANGELES SECTION, American Society of Civil Engineers, met Oct. 8 to hear R. S. Gardner, of the Merritt-Chapman & Scott Corp., describe marine salvage operations.

MID-SOUTH SECTION, American Society of Civil Engineers, will hold its annual meeting at Greenville, Miss., on Nov. 14.

MISSOURI VALLEY SECTION, American Water Works Association, will hold its 16th annual meeting at Cedar Rapids, Iowa, Nov. 5-7. The section includes the membership of Iowa, Kansas, Missouri, South Dakota and eastern Nebraska. Papers scheduled for presentation will deal with water softening and purification problems. There will also be a round table discussion on water works troubles.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS has offered the services of its members as agents for surveying and expediting the public and private construction work in New York State, or in any other capacity, to Arthur Woods, recently appointed national director of unemployment relief by President Hoover.

NORTH DAKOTA WATER AND SEWAGE WORKS CONFERENCE will be held this year at Grand Forks, N. D., Dec. 8-10. A feature of this year's meeting will be a short course conducted by the school of engineering at the State University. A. L. Bavone, Bismarck, is secretary-treasurer of the conference.

ROCHESTER SECTION, American Society of Civil Engineers, on Oct. 24 entertained 60 seniors, graduate students and faculty members of Cornell University, who inspected engineering work in the vicinity of the city.

Construction Equipment and Materials

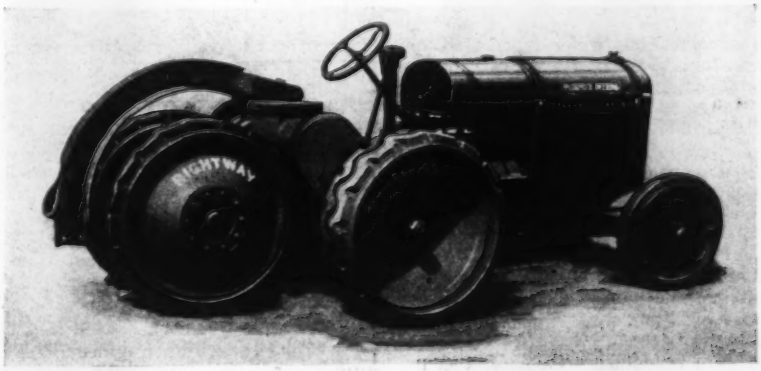
Rod for Welding Aluminum

Aluminum casting alloys, at temperatures just below the melting point, possess very little strength and have a high coefficient of contraction. The combined effect of these two properties sometimes causes cracks to occur in the castings when an attempt is made to weld them while held tightly in jigs. A new welding rod, designated Oxweld No. 23 aluminum rod, has been introduced by the Oxweld Acetylene Co., 30 East 42d St., New York City, which is recommended for welding aluminum alloys because its melting point is lower than that of the metal being welded and so will remain in the molten state after the base metal has solidified. The weld metal will, therefore, fill any voids that may have been created by the solidification and contraction of the base metal. Any stresses which might be caused by contraction will shift their effect from the base metal to the weld metal, which, being free from hot-shortness, will absorb the stresses without the development of cracks. The new aluminum rod is available in $\frac{1}{16}$-, $\frac{1}{8}$- and $\frac{1}{4}$-in. sizes. It coalesces readily with all aluminum alloys and possesses high strength and good corrosion resistance.

Two-Wheel Auxiliary Drive Unit Increases Traction

Wheel slippage on tractors can be greatly decreased by means of an auxiliary drive unit developed by the Rightway Corporation, 228 North La-Salle St., Chicago, Ill., for attachment to several makes of tractors. This device distributes the engine power to four drive wheels, in place of two. The auxiliary drive wheels are placed inside and to the rear of the tractor wheels, providing contact with the road at four points across the traveled surface. Each wheel carries its own share of the weight, and, as the drawbar is attached at a point high on the bracket connecting the drive unit to the tractor axle, the drawbar pull results in a downward thrust on the positively driven auxiliary wheels to give still greater traction. The manufacturer states that it is impossible for a Rightway-equipped unit to stall until both auxiliary wheels and one of the main wheels have completely lost traction.

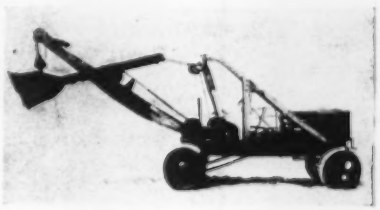
Driving power, transmitted through the regular tractor differential and rear axle to the rear wheels, is carried from each of these wheels by means of a chain and sprocket to the end of a jackshaft, with a second differential mounted between its two elements. In the same housing, and to the rear of the jackshaft, is a solid axle carrying the auxiliary traction wheels. These wheels are driven by a single chain from a sprocket mounted upon the cage of the jackshaft differential. Thus, the differential action between the end of the main tractor axle and the jackshaft is complete, but the action in the auxiliary differential is accomplished in a reverse manner. The auxiliary wheels are positioned midway between the two main wheels, so that their speed is correct for any turning radius. With this arrangement when one (or both) of the tractor wheels loses traction it is held at normal speed, and the power which it is unable to utilize is transferred to the auxiliary wheels.



MULTI-WHEEL DRIVE ON McCORMICK-DEERING TRACTOR

Tractor Crane Available with Wheel Mounting

By substituting four rubber-tired wheels for the crawler mounting on its well-known tractor shovel, Bay City Shovels, Inc., Bay City, Mich., has developed a unit, known as the Cranemobile, which can be interchangeably equipped with crane, dragline or clamshell equipment, or used as a shovel. Bucket capacity in all cases is $\frac{3}{8}$ cu.yd. This machine is not intended to replace the tractor shovel, which will be continued in production, but is designed for another field of work where hard surface conditions favor a wheel-mounted machine. Power is provided by a McCormick-Deering or Allis-Chalmers industrial tractor unit built permanently into the machine. Three forward speeds and a reverse give speeds of from $\frac{3}{4}$ to 7 m.p.h. With all mountings the boom will swing through 270 deg. of arc.



CRANEMOBILE RIGGED AS SHOVEL

Gasoline Replaces Acetylene in Metal-Cutting Torch

Announcement of the development of a metal-cutting torch which uses gasoline in place of acetylene or other fuel gases has been made by the Torchweld Equipment Co., Chicago, Ill. The unit consists of a cutting torch with four cutting tips, 25 ft. of high-pressure oxygen hose, 25 ft. of flexible metallic gasoline hose, a 2-gal. welded gasoline tank, a regulator, and accessories. Advantages gained by the substitution of gasoline for other fuel include the following: simplicity in design, availability of fuel supply, elimination of the inconvenience and expense of fuel containers, greater safety because of the elimination of torch flashing, and lighter weight. Use of a small gasoline tank in place of the usual acetylene gas storage cylinder reduces the weight of the outfit approximately 60 per cent, so that it can be mounted on a small truck easily handled in crowded spaces.

GASOLINE - OXYGEN TORCH

Special Tractor Treads for Unusual Working Conditions

New track equipment for the Monarch 35 tractor, made by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., includes the wide-angle track shoes shown in the illustration. These shoes are built in 18-, 24- and 28-in. widths and provide the extra traction needed for work in unusually loose soil, in swamps

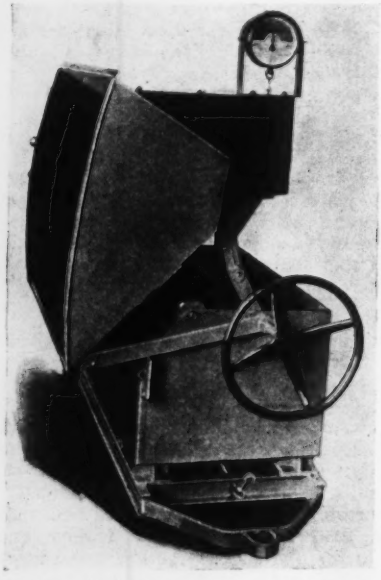
TRACTOR WITH WIDE-ANGLE TRACK SHOES

or on steep hillsides. In addition to the wide-angle tracks, this model can be equipped with standard tracks built in extra widths. There is also a wide-tread Monarch 35 now available in which the tracks are built farther apart. This arrangement gives the tractor greater stability on steep hillsides or for use with such equipment as side boom hoists or cranes.

Weighing Batcher for Small Concrete Mixers

In an increasing number of states highway department specifications require that concrete aggregates, especially on bridge and culvert construction, be measured by weight. For doing this quickly and accurately the Knickerbocker Co., Jackson, Mich., has developed a device known as the Tilt-Weigh batcher which can be used to charge any type of mixer equipped with a power loading skip. It is built in two sizes, with hopper capacities of 13 and 19½ cu.ft.

The batcher is placed in close proximity to the end of the mixer skip and can be charged either by direct shoveling from stockpiles or by wheelbarrows run onto a temporary wooden platform. Sand should be placed in the hopper first, so that, when a batch is dumped, the stone will be on the bottom. Proportioning is by means of a scale with two weigh arms, one for sand and one for stone. After the poises on the beam have been set for the predetermined weights, the door of the beam case should be locked to prevent tampering. A telltale dial is used to show an approach to the proper balance. After the aggregates have been weighed, the hopper, which is pivoted on two rollers, is tilted over by means of a wheel which actuates two sets of toggles.



WEIGHING BATCHER ATTACHMENT

Rubber Crawlers Available for Light Grading

For fine grading and shoulder work or for maintenance work where speed with quiet operation is essential, the W. A. Riddell Co., Bucyrus, Ohio, can now equip its motor graders with rubber crawlers which can operate on soft sub-grades or on pavements without damage to the surface. The rubber tread, which is manufactured by the Goodyear Tire & Rubber Co., Akron, Ohio, is interchangeable with either the steel crawler or with rubber-tired wheels on the same tractor axle. Normal area of ground contact is 800 sq.in., with a ground pressure of 5.7 lb. per square inch when mounted on the standard Warco model E grader powered with a McCormick-Deering model 20 industrial tractor.

RUBBER CRAWLER MOUNTED ON ROAD GRADER

The rubber crawler is so mounted that both front and rear idler wheels are positively driven by means of a chain of the continuous roller type. Driving both wheels decreases the strain on the driving chain and increases the life of the rubber tread by eliminating most of the pull from the bottom run. Both idler wheels are adjustable and are held in tension by rustproof bolts. Chain sprockets are machine cut, casehardened and riveted to the hubs. Idler wheels and drive sprocket hub bearing are roller bearing mounted and effectively sealed against dirt. The rubber tread itself is of the non-skid variety and has a coarse fabric core which practically eliminates stretch. In tests conducted by the manufacturers the rubber crawlers have proved superior to steel crawlers for light work.

New Publications

Oil and Grease Retainers—A booklet describing the patented, self-contained leather oil seal made by the CHICAGO RAWHIDE MFG. CO., 1301 Elston Ave., Chicago, Ill., has been issued by that company.

Paint—"The Light Reflection Value of Colors in Paint," an 18-p. booklet issued by the NEW JERSEY ZINC CO., 160 Front St., New York City, gives valuable hints to be considered in the choice of colors and paints for industrial uses.

Sheet Iron—Recent publications of the AMERICAN ROLLING MILL CO., Middletown, Ohio, include a bulletin on suggested A.S.T.M. specifications for open-hearth plates and one describing the cooling and ventilating apparatus in the new Minneapolis Civic Auditorium.

Cranes—The Hi-Lo crane, designed for high lifts with low headroom, is described in a 4-p. folder of the WHITING CORP., Harvey, Ill.

Aluminum Castings—Citing the advantages of aluminum die casting and giving a general picture of the process, a 24-p. illustrated bulletin of the ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa., pictures many interesting uses of aluminum castings.

Electric Motors—Totally inclosed fan-cooled induction motors of the squirrel-cage type are described in leaflet 2124 of the ALLIS-CHALMERS MFG. CO., Milwaukee, Wis.

Compressors—Two bulletins issued by the PENNSYLVANIA PUMP & COMPRESSOR CO., Easton, Pa., cover two-stage tandem type air compressors and duplex two-stage and single-stage compressors for air and gas.

Pipe—Structural advantages of Naylor spiral-weld Toncan iron pipe, as demonstrated by laboratory tests, are indicated in a 44-p. illustrated bulletin 30-2 published by the NAYLOR PIPE CO., 1230 E. 92d St., Chicago, Ill. Illustrations show many installations of this pipe under widely varying conditions.

Asphalt Paving—"Asphalt for Highways and Airports" is the title of a 32-p. illustrated bulletin published by the ASPHALT INSTITUTE, 801 Second Ave., New York City, which gives a summary of American design and construction methods and developments in paving, surfacing and subgrade stabilization.

Paint—"Industrial, Technical and Architectural Finishes," a 26-p. booklet issued by the NORFOLK PAINT & VARNISH CO., Norfolk Downs, Mass., contains information valuable in the solution of painting problems relating to the maintenance of interior and exterior surfaces in industrial plants, railroads, public buildings and homes.

Cost and Contracts

E. N.-R. Index Numbers

	Cost			Volume	
Oct. 1, 1930	**198.72**	**Sept., 1930**	**232**
Sept. 1, 1930	199.58	August, 1930	259
Oct. 1, 1929	206.32	Sept., 1929	340
Average, 1929	207.02	Average, 1929	317
Average, 1928	206.78	Average, 1928	287
1913	100.00	1913	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Oct. 30, with some comparisons, total as follows:

(In Thousands of Dollars)

	Oct. 30, 1930	Average of Last Four Weeks 1930	1929
Buildings:			
Industrial	$4,035	$4,269	$19,708
Other	23,627	23,044	24,652
Streets and roads.	8,204	8,071	9,675
Other eng. constr..	10,255	11,517	11,275
Total	$46,121	$46,902	$65,311

Total, all classes Jan. 1 to Oct. 30:

1930	$2,812,106
1929	3,551,439

Unit Prices From Current Construction Bids

Two Highway Bridges in Washington State

STATE highway department of Washington recently awarded contracts for two bridges in Benton and Jefferson counties, respectively in the southeast and northwest portions of the state. The one is reinforced-concrete, the other a steel truss, and the contract prices are $84,175 and $83,070.

The concrete structure at Prosser, on state road No. 3, replaces a six-span timber Howe bridge over the Yakima River. The new bridge, of five reinforced-concrete arches and six concrete-girder approach spans, is symmetrical except for small differences in the footings. It is 675 ft. long, with center span 130 ft., adjoining spans 120 ft., end spans 112½ ft., each connecting with 40 ft. of slab approach. Roadway is 24 ft., with 4-ft. sidewalk on each side.

Fine aggregate is available within 35 miles at the Attalia pit owned by the state, where complete washing and screening equipment is at the disposal of the contractor. The charge is 5c. per cubic yard. Concrete is of four classes: A, 3,500-lb.; B, 2,500-lb.; C, 1,800-lb.; D, for use under water. Class D is for constructing footing seals; B, for approach-span footings, end walls to bottom of slab fillets, columns to top of caps, abutments and piers above seals, except abutment 6, which may be class C; A, all other. Sequence of pouring: (1) all footing seals; (2) approach footings, abutment tops and piers; (3) crown section of ribs; (4) haunch section of ribs; (5) key section of ribs; (6) arch columns and pier column walls; (7) approach to top of caps and endwalls to bottom roadway fillet; (8) crossbeams and spandrel walls; (9) roadway slab and all brackets; (10) curb sidewalk and handrail curb; (11) handrail posts; (12) handrail. Table I gives unit prices of the lowest two bidders: A, MacRae Brothers (contractor), 614 Fifth Ave., Seattle; B, Sam Boudrye, Charleston.

The steel structure, over the Hoh River on state road No. 9, is 394½ ft. long including two reinforced-concrete girder approach spans. The center span of fourteen panels of 17⅜ ft. is flanked by four panels of 17⅝ ft. This span is erected from both sides as a cantilever, nine panels in the north arm and five panels in the south arm. In its completed condition the structure consists of two cantilever arms of five panels each and a suspended span of four panels.

Aggregates sufficient to complete the structure are furnished gratis in stockpiles on the grade at the south bank of the river. All concrete in piers up to bottom of coping is class C, except footing seals of Nos. 2 and 3 (class D). Copings, column footings, columns to bottom of girder fillets, column struts, and backwall of pier 4 are class B. All other concrete is class A. Roadway slab on the steel span is poured on the anchor arms before pouring slab on the cantilever span. All stringers are riveted to the floorbeams as erection proceeds on the cantilever arms; riveting one panel behind erection. Backwall on pier 4 is poured after the steel span is erected and adjusted. Table II gives unit prices of the lowest two bidders: A, Union Bridge Co. (contractor), 101 Porter Bldg., Portland, Ore.; B, Commercial Construction Co., Seattle. Samuel J. Humes is director of highways.

TABLE I—REINFORCED CONCRETE OVER YAKIMA RIVER

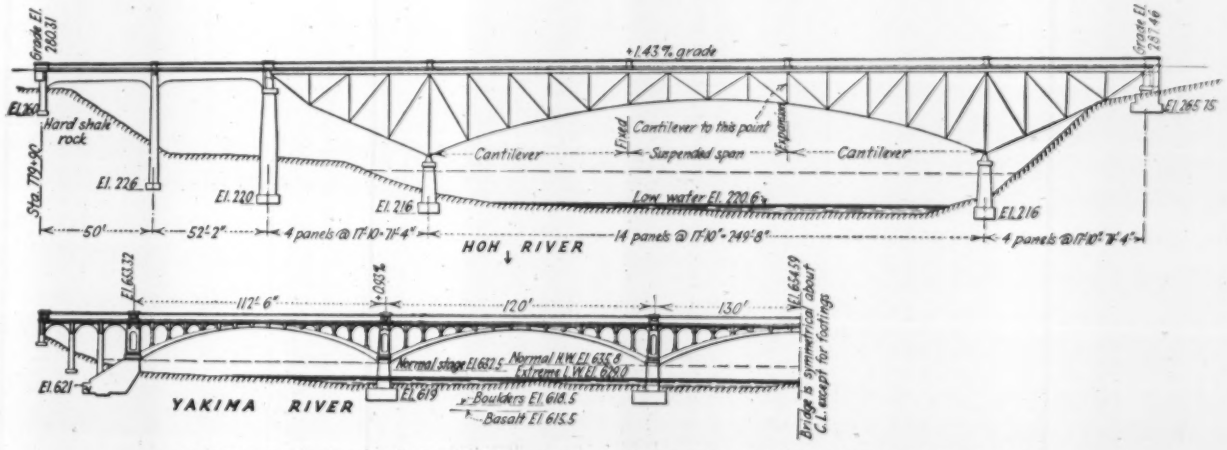
	A	B
1,200 cu.yd. structure excavation	$7.00	$7.00
1,775 cu.yd. concrete class "A" in place	21.45	23.00
562 cu.yd. concrete class "B" in place	21.00	23.00
107 cu.yd. concrete class "C" in place	20.25	20.00
374 Cu.yd. concrete Class "D" in place	19.75	22.00
260,000 lb. steel reinf. bars in place	.0475	.05
250 lb. copper seals in place	.60	1.00
Removing existing structure (lump sum)	1,893.00	3,000.00
Lighting system complete in place (Except posts and fixtures)	380.00	500.00
12 lamp posts and fixtures	39.00	50.00
Totals	$83,070	$89,869

TABLE II—DECK CANTILEVER OVER HOH RIVER

	A	B
Clearing and grubbing (lump sum)	$950 00	$2,789 00
850 cu.yd. structure excav.	6 00	9 00
450 cu.yd. concrete Class A in place	27 00	22 00
100 cu.yd. concrete class B in place	27 00	22 00
405 cu.yd. concrete Class C in place	27 00	22 00
80 cu.yd. concrete Class D in place	27 00	22 00
102,000 lb. steel reinf. Bars in place	055	06
597,000 lb. structural steel in place	07	077
13,500 lb. cast steel in place	1¼	13
340 lb. bronze expansion plates in place	50	75
500 lb. copper seals	50	70
20 cast steel drains complete in place	10 00	29 60
Totals	$84,175	$88,250

36-in. Water Pipe for Detroit

BIDS were received in Detroit, Mich., Sept. 16, 1930, for furnishing in place 4,700 ft. of 36-in. water main. Accessory work amounted to about 25 per cent of the total price. Types considered were lock bar, hammer welded, electrically welded, and riveted, of steel or of Armco or Toncan iron. The contract was awarded on electrically welded Toncan iron pipe to Julius Porath & Son, 903 Transportation Bldg., Detroit, for $81,390 less 20 per cent deducted for Dresser couplings. The second lowest bidder was R. D. Baker Con-



ELEVATIONS OF HIGHWAY BRIDGES OVER YAKIMA AND HOH RIVERS, WASHINGTON

Unit Prices From Current Construction Bids

struction Co., Royal Oak, Mich., $85,320 for the same pipe. Unit prices and total prices are given of these two contractors.

Steel:	A	B
Lock bar	$13.00	$11.90
Electrically welded	12.25	10.90
Riveted	.....	12.25
Armco Iron:		
Electrically welded	13.65	12.51
Toncan Iron:		
Electrically welded	13.60	12.35
Setting one 36-in. gate valve	125.00	200.00
Building one 36-in. gate well	750.00	1,000.00
Building seven manholes and air valve wells	100.00	125.00
Setting five 12-in. gates and building wells	125.00	100.00
Building 100 lin.ft. pipe tunnels	75.00	135.00
4,600 lb. steel castings	.25	.30
4,000 lb. c.-i. castings	.10	.15
600 cu.yd. conc. piers and pipe anchorages	10.00	15.00
50 tons crushed stone	3.00	3.00
35 cu.yd. cinders	2.00	2.00
Totals:		
Lock-bar steel pipe	78,570	83,205
Electrically welded steel	75,045	78,505
Riveted steel	.....	84,850
Electrically welded Armco iron	81,625	86,072
Electrically welded Toncan iron	81,390	85,320
Evaluated Bids:*		
Lock-bar steel	110,050	116,542
Electrically welded steel	105,113	109,959
Riveted steel	.....	118,847
Electrically welded Armco iron	104,436	110,125
Electrically welded Toncan iron	104,135	109,163

*The evaluation factors are thus described in the specifications: "The total bid price quoted for all items of the contract for each type of pipe proposed to be used should be multiplied by 1,734, which represents the total payment required to pay interest and sinking fund charges on each dollar of 30-year 4 per cent bonds. From the products obtained by the above multiplications there shall be deducted, for all cases where the use of steel pipe is contemplated, one-seventh the total prices quoted, and for all cases where the use of Armco pipe is contemplated, one-third the total prices quoted. The amounts remaining after the subtractions have been made shall become the evaluated bids to be used for comparison."

Soft Dredging in San Joaquin River, Calif.

A CHANNEL is being dredged in New York Slough, which extends across two shoals to deep water in the San Joaquin River, Calif. The Hydraulic Dredging Co., Oakland, was given the contract in September at $0.0947 for 779,000 cu.yd. of sediment and sand. The channel is 6,000 ft. long, 26 ft. deep at m.l.w., and 300 ft. wide at the bottom, with side slopes 1 on 4. Average rates of removal are specified as 150,000 cu.yd. the first month and 200,000 thereafter. There is an overdepth allowance of 2 ft. (102,500 cu.yd.). Tide range is 4 to 6 ft., with a high flood stage of 9 ft., and a maximum current of 3 m.p.h. The slough is 800 ft. wide in the dredging area and 2.5 ft. under water. Some interference must be expected from launches and stern-wheel steamers. Spoil area averages 3,000 ft. from the job, 5,000 ft. maximum. Work is under the supervision of the U. S. Engineer Office, Sacramento.

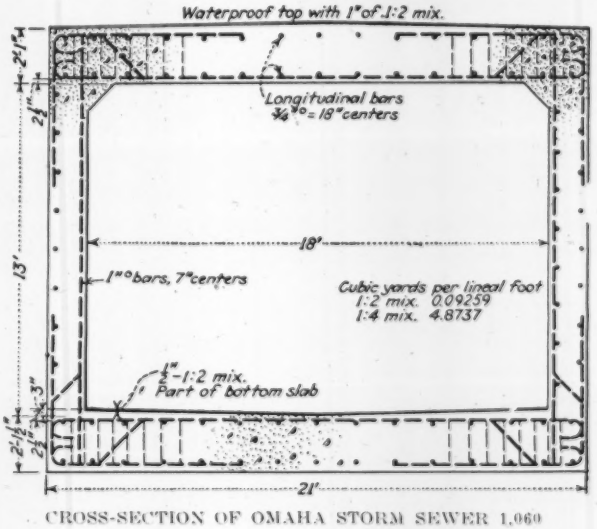
Two Steel Standpipes for Dayton

BIDS were received Oct. 3, 1930, for two 900,000-gal. cylindrical high-service steel standpipes 90 ft. high by 42 ft. diameter for Dayton, Ohio, and contract was awarded to Chicago Bridge & Iron Works for $28,295, work to be completed in 105 days. Side plates are in courses of large and small diameter that lap over one another inside and outside alternately. Joints for horizontal seams and for bottom plates are lapped. Joints for vertical seams are double-riveted lap for $\frac{1}{4}$-, $\frac{5}{16}$- and $\frac{3}{8}$-in. plates; triple-lap joints for $\frac{7}{16}$- to $\frac{3}{4}$-in. plates; triple or quadruple riveted butt joints for $\frac{13}{16}$- to 1-in. plates. Rivets are $\frac{5}{8}$ to 1 in. Watertightness is to be obtained by calking only. Tanks are covered by self-supporting conical roofs. Bids were for either one or two standpipes, as follows:

	One	Two	Per Gal.
Chicago Bridge & Iron	$15,120	$28,295	$0.0157
Pittsburgh-Des Moines Steel	16,175	31,488	.0175
Graver Tank & Mfg.	16,350	32,700	.0182
Stacy Bros.	18,670	36,860	.0204
Average	$16,579	$33,114	$0.0184

Reinforced-Concrete Sewer for Omaha

STORM SEWER 1,060 for Omaha runs from Center St. at 56th St. to Westbrook Ave., and along Dupont St. to West Lawn Park, a distance of 1,750 ft. The principal section is 1,719 ft. of 13x18-ft. reinforced concrete, as shown in the drawing; contract price $81.80; average of the six bids opened June 20, 1930, was $92. This item accounts for 96 per cent of the cost, the remaining 6 per cent including



CROSS-SECTION OF OMAHA STORM SEWER 1,060

some reinforced-concrete pipe and monolithic construction. All excavation is open-cut and trenches are not opened for more than 300 ft. from completed backfilling to solid ground at the other end. Surface materials from excavation are held for possible repair of resurfacing. Concrete is 1:2½:3½ crushed stone or, if Platte River sand gravel is used, 1:4 sand and gravel, by volume, mixed one minute and compacted in place.

Unit prices are given for the six bidders: A, Humphreys Bros., 408 Securities Bldg., Omaha, contract; B, John Kerns Constr. Co.; C, Harrington Constr. Co.; D, F. L. Busche; E, J. J. Hanighen Co.; F, H. J. Petersen Co. Herman Beal is city engineer.

	A	B	C	D	E	F
32 lin. ft. 27-in. reinf.-conc. pipe	$5.25	$6.00	$4.00	$5.00	$4.00	$5.00
50 lin. ft. 18-in. reinf.-conc. pipe (drain)	1.75	3.00	2.50	3.50	2.00	3.50
25 lin. ft. 27-in. reinf.-conc. pipe (drain)	5.00	6.00	3.50	5.00	4.00	5.00
20 lin. ft. 13x18 ft. x 13x14 ft. reinf. conc. monolithic funnel	95.00	89.45	102.50	88.70	96.72	106.00
287 lin. ft. 54-in. reinf.-conc. mono. pipe	7.25	7.50	12.00	10.00	8.85	9.55
30 lin. ft. 8 ft. reinf.-conc. mono. pipe	22.00	25.35	27.00	33.00	24.00	27.00
1,719 lin. ft. 13x18 ft. reinf.-conc. mono. pipe	81.80	89.45	92.75	92.80	97.50	101.00
Totals	$146,810	$160,544	$167,483	$167,563	$174,453	$181,142

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Waterworks			
Seattle	Pipe lines	$1,207,116	Contract
Sewer			
Atlanta (Ga.)	Sewerage system	10,814,900	Proposed
Railways			
Missouri	Railroad, etc	7,000,000	Proposed
Ontario	Railroad	2,000,000	Proposed
Federal Government			
New York	Office	1,673,292	Contract
Subways and Tunnels			
Vancouver (B. C.)	Tunnel	1,000,000	Bids asked
Grade Crossings			
Los Angeles	Grade separation	1,330,000	Proposed
Power and Lighting			
Evanston (Ill.)	Lighting system	1,500,000	Proposed
Unclassified			
New Brunswick (N. J.)	Radio station	2,000,000	Bids asked
Foreign			
Jugoslavia	Roads and railways	36,000,000	Bids asked
Garages			
Philadelphia	Parking garage	1,500,000	Contract
Buildings			
Newark (N. J.)	Apartments	1,000,000	Bids asked
Seattle	City light	2,225,000	Contract
Fort Worth	Freight terminal, etc	1,000,000	Proposed
Hollywood (Calif.)	Laboratory and studio	1,000,000	Proposed
New York	Office	2,000,000	Proposed
Sacramento	Schools	2,000,000	Proposed
Chicago	High school	2,500,000	Bids asked
Cleveland	Stores	10,000,000	Contract
Hackensack	Theatre	1,000,000	Bids asked
San Antonio	Theatre	1,500,000	Proposed
New Orleans	Vegetable terminal	800,000–1,000,000	Proposed

WATERWORKS

PROPOSED WORK

Ark., Hazen—Preliminary plans complete waterworks, distribution lines, sewerage system. **Maturity indefinite.** F. R. Allen, Pine Bluff, engr.

Ariz., Peoria—Preliminary plans installing new waterworks. $25,000. Morse Eng. Co., Drew Bldg., Mesa, engr.

Calif., Santa Cruz—Surveys 11,000 ft. 20 in. main extensions. $35,000. R. Fowler, city engr.

Mass., Marblehead—Town, connecting water supply with Lynn water system. $75,000 appropriated. Engineer not selected.

Mass., Newton—City, altering and constructing extensions to waterworks, incl. supply building and surface drains, Watertown St. To exceed $15,000. C. S. J. White, 825 Beacon St., Newton Centre, engr. Noted Sept. 18.

Mass., Westminster—Town, waterworks. To exceed $15,000. F. Derby, Town Hall, chn. comn.

Minn., Morris—City, J. A. Mielkhe, city clk., 750,000 gal. rein.-con. reservoir. $30,000.

N. J., Margate City — Bd. City Comrs., City Hall, preliminary plans extending waterworks. $15,000. E. D. Rightmire, city engr.

N. Y., Cobleskill—Reservoir and dam. $50,000. R. Wheeler, 36 State St., Albany, engr.

N. Y., Creedmoor — Dpt. Mental Hygiene, State Office Bldg., Albany, bids in December, sewers, water lines at Brooklyn State Hospital, Creedmoor Div. $60,000. T. F. Farrell, Albany, state engr.

N. D., Grand Forks—Waterworks. $250,000. Burns, McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs. Noted Oct. 23.

N. D., Minot — Improving, enlarging waterworks. $75,000 bond election may be voted on next month for same. G. A. Reishus, city aud.

O., Troy—Water softening plant. $90,000. Bond election in November, for same. G. L. Smith, Troy, dir. P. Wks.

Okla., Duncan — Preliminary plans new drilled wells, pumping equipment. $15,000. W. H. Hollingsworth, Duncan, engr.

Okla., Hinton—Preliminary plans new drilled wells, pumping equipment. $15,000. H. W. Miller, mayor.

Okla., Maysville—Preliminary plans main extensions. $15,000. C. E. Hamm, mayor.

Ont., Peterborough—City Council 8 in. up vitr. tile drainage system. $42,000. R. H. Parsons, Municipal Offices, engr.

BIDS ASKED

Calif., Anaheim — E. B. Merritt, city clk., taking bids 7,361 ft. 4- to 8-in. Class B c.i. pipe, also 5,000 lb. fittings.

Calif., Beverly Hills — Nov. 5, by B. J. Firminger, city clk., 6,320 ft. 4 and 6 in. mains.

Calif., Whittier—See "Contracts Awarded."

Ky., Louisville—See "Contracts Awarded."

Minn., Minneapolis—Nov. 6, by F. S. Gram, city purch. agt., drilling 4 deep wells for Bd. Park Comrs., A. E. Berthe, city engr.

N. J., Livingston—Nov. 3, by Twp. Comn., Central School Bldg., 6 in. universal watermain in Sunset Dr. $15,000. W. S. Logan, Fire House, twp., engr.

N. Y., Long Island City—Nov. 7, by J. J. Dietz, comr. Water Supply Gas & Electricity, Municipal Bldg., New York, relaying mains in Northern Blvd. and grounds Bayside Pumping Station.

N. Y., New York — Nov. 7, by J. J. Dietz, comr. Water Supply Gas & Electricity, Municipal Bldg., furnishing delivering, setting 6 in. valves, appurtenances of hydrant branches connecting to mains in Manhattan Boro.

N. Y., St. George—Nov. 7, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, Academy Pl., Todt Hill Rd., Beverly, Central, Forest, Huguenot, Hull, Longfellow, Rostellan, Stebbins, Treadwell, and Vineland Aves.

Wash., Seattle — Bd. P. Wks., bids about December, 75 m.g. reservoir and two 1 m.g. steel standpipes forming gravity system for West Seattle Dist. $775,000. R. H. Thomson, city engr.

See proposal advertising on page 93

CONTRACTS AWARDED

Calif., Red Bluff—For 1,000 ft. 4 in. Class 100 c.i. pipe, to Pacific States Cast Iron Pipe Co., 111 Sutter St., San Francisco, at $0.48 per ft. Noted Oct. 1.

Calif., Whittier—D. E. Allen, city clk., 10 m.g. reservoir, force account, under supervision M. R. Bowan, city engr. Former bids rejected. Noted Oct. 8 under "Contracts Awarded."

Kan., Leotl—C. H. Simon, city clk., complete waterworks, except well, pumps, incl. 22,780 ft. 2- to 8-in. c.i. pipe, 11,000 lb. c.i. specials, 30 fire hydrants, twenty-nine 2- to 8-in. gate valves, pump house, 50,000 gal. steel tank on 100 ft. tower, to C. L. Burt, 1005 North Washington St., Hutchinson, $27,947. Noted Sept. 11.

Ky., Lexington—Lexington Water Co., laying 6.5 mi. 20 in. c.i. pipe connecting with Kentucky River, also 2 pumping stations, to Louis des Cognets Co., Lexington.

Ky., Louisville—Louisville Water Co., 435 South 3rd St., 47,800 ft. 6- to 12-in. c.i. mains to Glenview and other suburban districts, own forces. $140,000. J. Chambers, c/o owner, engr. Noted Oct. 9.

Mass., Boston—City, Dpt. P. Wks., 50 gate hydrants, to McCulloch Mfg. Co., 200 Old Colony Ave., South Boston, $4,700.

Mass., Norfolk—Commonwealth of Massachusetts, Administration and Finance Comn., State House, Boston, 2 horizontal split cases, 2 stage centrifugal pumps together with motor and priming equipment and automatic pressure control, for State Prison Colony, to Turbine Equipment Co. of New England, 80 Federal St., Boston, $5,580.

Mich., Detroit — Bd. Water Comrs., L. P. Fisher, pres., filter operating tables, incl. installation gages, pressure tubing at filtration plant, Springwells Station, West Warren Ave., Contr. FC-19, to International Filter Co., 333 West 25th Pl., Chicago, Ill., $56,206. Noted Oct. 2.

Mo., Cuba — For 1,250 ft. deep well, two 150 g.p.m. centrifugal pumps, 50,000 gal. tank on tower, 6 mi. 2- to 6-in. pipe, hydrants, to F. A. Phelps, 4889 Margarette Ave., St. Louis. Est. $30,000. Contractor taking bids on subcontracts. City selling bonds Nov. 1.

Miss., Vicksburg—Low lift emergency pump and motor equipped with oil spouting devices to deliver 4 m.g.p.d. and 12 in. foot valve, to Fairbanks-Morse & Co., 1000 St. Charles St., New Orleans, La., $1,428 and $40 respectively; carriage, to Mississippi Steel & Iron Co., Jackson, $1,850. Grand total $3,338.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Prospect Park West, Flatbush, Flushing Aves., to Ozone Park Water Pipe Constr. Co., 96-29 Rockaway Blvd., Queens, $4,400. Noted Oct. 16.

O., Gates Mills—Village, mains in Highland Rd. to Angelo Marra Co., 1479 Green Rd., Cleveland, $34,000.

Tex., Toyah—City, c/o A. H. Bruce, secy., improving waterworks, incl. 10,000 ft. ¾-in. to 8-in. c.i. pipe welded joints, fire hydrants, meters, to Panhandle Constr. Co., Ludbook, $25,000.

Wash., Seattle — Bd. P. Wks., Cedar River and West Seattle Pipe Lines, to Queens City Constr. Co., 603 18th Ave. S. $1,207,116. Noted Oct. 2.

Wis., Milwaukee—City, elevated water tank, steel on Hawley Rd. and Marten Dr., to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $99,500.

Wis., Milwaukee—Dpt. P. Wks., mains in East Capitol Dr., to Wenzel & Henoch Constr. Co., 5025 State St., $51,310; West Burleigh St., to F. E. Kominski, 752 46th Ave., West Allis, $4,652.

SEWERS

PROPOSED WORK

Calif., Long Beach—Storm drain in northeast section city. $700,000. H. Paterson, city engr. Noted May 15.

Calif., Los Angeles—Los Angeles Co. 41,900 ft. 8 in. vitr. sewer, 13,360 ft. 8 and 10 in. vitr. sewer on concrete cradle, 33,000 ft. 6 in. vitr. house connections, 47 flushing manholes, 81manholes in Graham Unit 4 Bair Ave. et al.

Conn., New Britain—Sewers. $150,000 bonds voted for same. City builds. Winter program to relieve unemployment. P. A. Merian, city engr.

Ga., Atlanta—Whitman, Requardt & Smith, engrs., Baltimore Trust Bldg., Baltimore, Md., filed report recommending improvements to sewerage system, for City. $10,814,900. Robert & Co., Bona Allen Bldg., assoc. engrs.

Ind., Muncie—Sewage disposal plant. To exceed $25,000. P. R. White, Muncie, engr.

Constr. News page 177

LEADITE

Remember—

Leadite makes good, tight joints, on any size bell and spigot water line. It will save time, money and labor;---and Leadite is specified and used by Water Works men most everywhere, because it "gives results" (and after all, "results" always count) Leadite is used on thousands of miles of bell and spigot pipe.

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

No Caulking

Sewers (Continued)

New Jersey — Mayor and City Councils of Somerville and Raritan, joint sewage disposal plant. W. D. Vosbury, 509 Cooper St., Camden, engr.

N. J., Pleasantville—Bd. City Comrs., City Hall, municipal sewage disposal plant. $60,000.

N. Y., Albany—Bids probably in December, sewer and manhole in Wilkins Ave.; sewers, watermains, grading, curbing, paving Highland, New Scotland and Hackett Aves. J. G. Brennen, city engr.

N. Y., Hudson — Sewers, disposal plant, $100,000. T. F. Bowe, 110 William St., New York, consult. engr.

Tex., Fort Worth—City, c/o O. E. Carr, concrete storm sewer in East Front St. from Jones to Oak Sts. $30,000. D. L. Lewis, Fort Worth, engr.

Ont., Fergus—City Council sewerage system. W. L. Ham, recvr. Engineer not selected.

Ont., Orillia — City Council 1.25 mi. drain from Mississaga St. to Lake Simcoe, and installing pump at lake. M. Johnston, chn. com. Engineer not selected.

Ont., Toronto—York Twp., improving Rockliffe Blvd. Sewage Disposal Plant. $450,000. F. B. Goedike, 40 Jarvis St., engr. Gore, Nasmith & Storrie, Confederation Life Bldg., consult. engrs.

BIDS ASKED

Ill., Chicago—Nov. 6, by City at office Bd. Local Impvts., City Hall, system of concrete, brick, tile sewers with concrete bulkheads, concrete diversion chambers, brick manholes, brick catch basins in easements across lands of Sanitary District of Chicago and in following streets. Across Lands, Bernard St., Devon, Lincoln, Kimball, North St. Louis, Rosement, Drake, North Central Park, Monticello, North Lawndale, North Ridgway, North Hamlin, North Avers, North Springfield, Harding, Crawford, Keystone, Karlov, Kidvale, Keeler, Kildare, Kostner and Highland Aves.; drains in Eddy St., Beverly, South Crawford, Foster, Odell, Barry, Cullom, North Laverne, North Merrimac, North Mulligan, Vanderpoel, South Keating, South Kilpatrick and South Knox Aves.; c.i. water supply pipes, special castings, c.i. fire hydrants and valves, brick valve basins in West 94th St., South Crawford, Everell, Las Casas, Mankato, Medford, McAlpin, and Caldwell Aves. $733,000. M. J. Faherty, pres. Noted Feb. 21 and May 23, 1929.

Ill., Chicago—Nov. 20, by H. E. Hoff, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., R. A. Woodhull, chn., West Side Intercepting Sewer, Contr. 3; adv. E. N.-R. Oct. 30.

Ky., Louisville—Nov. 18, by Bd. Sewerage Comrs., M. H. Crawford, chn., 400 Marion E. Taylor Bldg., 4th and Jefferson Sts., Montana Avenue Sewer, Sect. A, Contr. 52. W. M. Caye, technical engr.

La., Donaldsonville—Bids about Dec. 2, complete sewerage system. J. W. Billingsley, Interstate Bank Bldg., New Orleans, engr.

Mass., Boston — Nov. 3, by Dpt. P. Wks., J. A. Rourke, comr., sewerage works in West Roxbury; Nov. 6 in Hyde Park; Nov. 10 in Brighton. Est. $25,000.

Mass., Boston — Nov. 6, by Metropolitan Dist. Comn., 1 Ashburton Pl., 2,933 ft. 72 x 75 in. concrete sewer, part of Sect. 109, New Neponset Valley Sewer, South Metropolitan System in Milton; 3,180 ft. 72 x 75 in. concrete sewer, part of Sect. 110, same system.

N. J., Newton—Nov. 5, by Town Com., A. G. Vough, clk., extending Sparta and Clinton Streets Sewage Treatment Works. T. F. Bowe, 110 William St., New York, consult. engr.; adv. E. N.-R. Oct. 30. Noted Oct. 9.

N. J., Rahway—Bids about Jan. 1, Rahway Valley Trunk Sewer, Sect. 5. C. Potts, 30 Church St., New York, engr. Noted Mar. 13.

New York—Jan. 9, by Westchester Co. Sanitary Comn., Court House, White Plains, 3 mi. section Saw Mill River Valley Trunk Line Sewer beginning at Hastings Pumping Plant, extending down Farragut Ave., to Lake Ave. in Yonkers. E. S. Martin, White Plains, secy.

N. Y., Brooklyn—Nov. 6, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, sewers in Farragut Rd., Alabama Ave., Linden Blvd., West 3rd, East 46th, East 92nd Sts.

N. Y., Buffalo—Nov. 6, by G. Fisk, comr. P. Wks., Municipal Bldg., 10 and 18 in. vitr. tile sewer to run across Delaware Park Meadow, from Delaware Ave. Hill to Jewett Parkway. W. Rathman, city engr.

N. Y., New York—Nov. 6, by J. Miller, pres. Manhattan Boro, Municipal Bldg., altering and improving sewers in Amsterdam and Seaman Aves., West 167th and 204th Sts.

N. Y., New York—Nov. 6, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Crotona Pl. and Eastchester Rd.

N. Y., Pine Aire Station—Nov. 12, by Commissioner Mental Hygiene, State Office Bldg., Albany, storm and sanitary sewers at Pilgrim State Hospital, Suffolk Co.

O., Struthers—Bd. Control bids about Nov. 15, 1½ mi. sanitary sewerage system, Nebo and Homecrest territory. $75,000. T. A. Roberts, mayor.

Pa., Phila.—Nov. 12, by Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., Schedule A, branch sewers in 11 streets and avenues; Schedule B, sewage disposal project, incl. dredging Frankford Creek, County Prison Intercepting Sewer, and Upper Frankford Creek Low Level Collecting Sewer and combinations; Schedule C, grading, drainage on Rhawn St. bridge over Pennypack Creek.

Ont., Hamilton—See "Contracts Awarded."

Ont., Ottawa—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Oakland—F. C. Merritt, city clk., 8- to 36-in. drainage structures, sewers in Hopkins St. and Midvale Ave., to W. J. Tobin, 527 Balfour St., $26,500. Noted Oct. 16.

Calif., San Diego—Sewage disposal plant at State Teachers College, to F. A. Rhodes, 2160 Hickory St., $26,000. Noted Oct. 23.

Ind., Anderson — E. Gwinnup, city engr., storm sewer in Columbus Ave. for Delco-Remy Plant, to Weis & Horan, Anderson. Est. $28,000.

Me., Portland—For 8- to 10-in. c.i. sewer in Ocean Ave. and Madeline St., to Chessi & Profenno Co., 67 Adams St.

Md., Baltimore—Bd. Awards, sanitary sewers, storm drains, Storm Water Contr. 156, to Marino Contg. Co., 305 North Exeter St., $21,303.

Md., Baltimore—Bd. Awards, sanitary sewers, storm drains in Sanitary Contr. 222, to W. H. Thompson, Relay, $37,344.

Mass., Boston—Dpt. P. Wks., Savin Hill Bay Sewerage Works, Sect. 5, from Old Colony Parkway to C. & R. Constr. Co., 75 Bradeen St., Roslindale, $132,944 Noted Oct. 9.

Mich., Detroit—Dpt. P. Wks., septic tanks in Warren Ave., west of River Rouge, to Mancini Constr. Co., 518 Transportation Bldg.; west of Fordson Hy., north of Warren Ave., to C. L. Carter, 1817 Stoepel Ave.

Mich., Detroit — Dpt. P. Wks., sewers in Trojan Ave. arm east of Five Points, to R. D. Baker, 15440 West Seven Mile Rd., $11,990—Lonyo Rd. sewer outlet section Vernor Hy. crossing, to H. J. Lemet, 2409 Book Tower, $53,506—11,474 ft. 12- to 24-in. vitr. crock sewers, 41 manholes for Lateral Sewer 5572, and 1,727 ft. 12- to 24-in. sewers, 6 manholes for Lateral Sewer 5586, to T. D. Nolan, 14101 Plymouth Ave., $37,500 and $4,750 respectively —2,804 ft. 12- to 24-in. vitr. sewers and 30 in. 2-ring brick cylinder, for Lateral Sewer 5583, to Fenkell Constr. Co., Transportation Bldg., $10,706—3,032 ft. 2 ft. 4 in. x 3 ft. 6 in. to 5 ft. 3-ring brick sewers, 10 manholes for Relief Arm 5588, and 2,489 ft. 2 ft. 4 in. x 3 ft. 6 in. and 5 ft. to 3 ft. 6 in. cylinder brick of 2- and 3-ring brick sewers for Relief Arm 5589, to Blanck & Gargaro, 40 Sevent Mile Rd. E., $33,557 and $25,983 respectively. Grand total $177,992.

N. J., Belmar—For 2,500 ft. 21 in. and 200 ft. 12 in. rein.-con. pipe for drainage system of Rhode Island Point System, to Core Joist Concrete Pipe Co., Irvington, at $1.60 and $0.85 per lin.ft. respectively.

O., Cleveland—For 1,800 ft. concrete storm drain at Southerly Sewage Disposal Plant, to D. Nero, 1424 Lakeview Rd., $32,595. Noted Sept. 25.

O., Newark—City, W. W. Davis, dir. Serv., 6,850 ft. 36 and 42 in. storm sewers in north fork of Licking River to Beech St., to Thomas D. Keys & Son, Newark, $70,000.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, to D. Spinosa, 462 East Cosgrove St., branch sewers in C St. from Ashland to Sheldon Sts., $986; to Vittorio & Ventresco, 423 East High St., Claridge and Howland Sts. from Foulkrod to Harrison Sts., $7,132, Knorr St. from Castor to Loretto Sts., $3,824, Tabor St. from Foulkrod to Harrison Sts., $3,287; to Vencinzo Ventresca, 6113 Ross St., Disston St. from Castor to Loretta Sts., $4,747; to Pandon Constr. Co., 41st and Poplar Sts., Kingsley St. from Pechin to Mitchell Sts., $765; to Leva Bros., 104 West Gale St., Mt. Pleasant Ave. from Michener to Cheltenham Sts. and Provident and Baynard Sts. from Mt. Pleasant to Mt. Airy Sts., $32,359; to E. Ventresco, 6016 Ross St., Paul St. from Bridge to Brill Sts., $435; to J. P. McDevitt, Inc., 6447 Frankford St., 16th St. from Cayuga to Wingohocking Sts., $9,704; to E. Fay & Son, 55th and Vine Sts., sluice in bank of Darby Creek at County line, $4,073; to Union Paving Co., 1227 North Broad St., Pennsylvania Terminal Improvement, Contr. 11, grading, paving 11 streets and boulevards, $172,142; to J. J. McHugh, 1617 Race St., South Philadelphia Improvements, incl. grading, sewers 25th St., $85,012, Henry Avenue Bridge approach over Philadelphia & Reading R.R., $30,723; to A. D. Sandro & Son, 6400 North 5th St., bridge over P. N. & N. Y. R.R. at Rising Sun Ave. and Bristol St., $99,809; to T. Burke & Co., Widener Bldg., bridge over Richmond Branch Reading R.R. at Mascher St., $93,984. Grand total $548,082. Noted Oct. 2.

Ont., Hamilton—City, West End Storm Sewer, day labor, during winter under supervision of W. H. McFaul, city engr. $500,000. Engineer preparing plans. Interested in prices of everything. Noted Sept. 11.

Ont., Hamilton—City, twin box type 9 ft. 6 in. x 7 ft., East End Sewerage System, day labor during winter, under supervision of W. H. McFaul, city engr. $350,000. Engineer preparing plans. Interested in prices of everything.

Ont., Ottawa—Storm sewers, day labor. $400,000. A. F. Macallum, City Hall, engr.

WASTE DISPOSAL

CONTRACTS AWARDED

Ia., Clinton—City, 25 ton in 8 hu. capacity incinerator, 41 ft. 6 in. x 36 ft. 4 in. outside size of flow plan, incl. 100 ft. stack, 5 ft. 4 in. diam., to Pittsburgh Des Moines Steel Co., Southwest 10th and Tuttle Sts., Des Moines, $35,900.

N. J., Red Bank—Bd. Boro Council, Boro Hall, incinerator plant, to Morse-Boulger Destructor Co., 205 East 42nd St., New York, $43,689. Noted Sept. 26 Daily.

BRIDGES

PROPOSED WORK

Calif., Oakland—Alameda Co., 400 ft. bascule bridge with 44 ft. roadway over Oakland-Alameda Estuary, Park St. $500,000. G. A. Posey, Oakland, co. surv.

Calif., Redwood City—Surveys bridge over Redwood Creek, replacement Bradford Street Bridge, in connection with proposed Main St. extension. To exceed $25,000. C. L. Dimmitt, city engr.

Kan., Kansas City — City and Kansas City Southern Ry. Co., 11th and Wyandotte Sts., Kansas City, Mo., A. N. Reese, ch. engr., 100 ft. steel, rein.-con. bridge, 22nd St. and Touromee Ave.

La., New Orleans—City, street and street-car traffic bridge to have arched opening for navigation, maximum vertical clearance 6 ft. above average water height, over Bayou St. John.

Missouri—See "Railways."

Nevada—State Hy. Dpt., Carson City, bridge on Arrowhead Trail between Bunkerville and Mesquite. $100,000. S. C. Durkee, state hy. engr.

N. J., Caldwell—Bd. Freeholders Essex Co., Hall of Records Bldg., Newark, preliminary plans timber bridge and 35,000 yd. road fill, along Western Essex Hy. $25,000. W. Stickles, Newark, co. engr.

Okla., Chickasha—Preliminary plans 8 span 100 ft. rein.-con. bridge over Line Creek at 12th St. $27,000. R. O. Bradley, Chickasha, engr.

Okla., Hominy—Osage Co. (Pawhuska) preliminary plans 7 span 118 ft. rein.-con. bridge over Hominy Creek. $30,000. W. H. Clark, Pawhuska, engr.

Okla., Lawton—Preliminary plans 6 span 108 ft. rein.-con bridge over Squaw Creek. $25,000. F. E. Lawrence, Lawton, engr.

Okla., Oklahoma City—Preliminary plans 1 span 30 ft. I-beams on concrete piers for underpass under Santa Fe lines at 1st St. $25,000. G. F. Brown, City Hall, engr.

Pa., Fayette City—Company forming, incl. O. D. Strader, 106 Park Blvd., Clarksburg, W. Va., D. A. Ritchie, Hayes Bldg., Fairmont, W. Va., N. C. Hubbard, Wheeling, W. Va., steel superstructure toll bridge, probably suspension type over Monongahela River. $400,000-$500,000. **Maturity in spring.** Robinson & Steuman, 117 Liberty Ave., New York, engrs. Owner will probably award contract without competition.

Tex., Christoval—Tom Green Co. (San Angelo) and State, bids early in 1931, probably 3 to 4 span, rein.-con., steel vehicular bridge over Concho River, on Hy. 30, near here. $75,000. T. J. Kelly, San Angelo, co. engr. Noted Sept. 18, under "San Angelo."

Ont., Petersburg—Dpt. Railways & Canals, Parliament Bldgs., Ottawa, steel swing bridge on concrete founds. over Trent Canal above Lock 19. $40,000. A. E. Dubuc, Ottawa, ch. engr.

BIDS ASKED

Calif., Pulga—Nov. 19, by State Hy. Comn., Sacramento, substructure bridge over North Fork Feather River, incl. 2 rein.-con. abutments, 2 rein.-con. piers, 6 concrete footings, 4 erection anchors, Butte Co. C. H. Purcell, P. Wks. Bldg., hy. engr.

Indiana — Nov. 12 by State Hy. Comn., Indianapolis, J. J. Brown, dir., three 36 ft. rein.-con. girder spans, one 72 ft. steel girder span bridge, incl. 23,000 cu.yd. approach excav. over New York Central R.R. at Brimfield, Noble Co.—60 ft. rein.-con. arch bridge over Six-Mile Creek at North Vernon, 30 ft. rein.-con. arch bridge over Nettle Creek at Scipio, 72 ft. steel truss bridge over Rock Creek at Scipio, all Jennings Co. — 60 ft. steel truss bridge over Little Sand Creek at Columbus, Bartholomew Co.—60 ft. steel truss bridge over Little Moon Ditch, 124 ft. steel truss bridge over Big Moon Ditch, 28 ft. rein.-con. girder bridge over Charles Farr Ditch, all S.R. 3, Pulaski Co.—32 ft. rein.-con. girder bridge over Pine Creek at Goshen ,Elkhart Co.—28 ft. rein.-con. girder bridge over Pollywog Ditch, Elwood, 24 ft. rein.-con. arch bridge over Tobin Creek at Tipton, both Tipton Co.—two 20 ft. rein.-con. slab spans, and two 24 ft. rein.-con. girder bridges over Birch Creek and 2 ditches near Haysville, one 40 ft. and one 50 ft. rein.-con. arch bridges, 32 ft. rein.-con. girder bridge over Frenzes Creek at Loogootee, all Martin Co.—50 ft. rein.-con. girder bridge and five 37 ft. span rein.-con. girder bridge, incl. 31,000 cu.yd. approach grading, both near Duanes State Park, Porter Co.— 84 ft. steel girder span and 40 ft. rein.-con. girder bridge over Baltimore & Ohio R.R., two 45 ft. rein.-con. girder spans and one 150 ft. steel truss span bridge over Boggs Creek both near Loogootee, Martin Co.—60 ft. rein.-con. arch bridge, incl. 10,000 cu.yd. approach grading over Eagle Hollow Creek at Madison, Jefferson Co.—60 ft. rein.-con. arch bridge over Goose Creek at Patriot, Switzerland Co.—96 ft. steel truss bridge over Birch Ditch at Ashboro, Clay Co.—32 ft. spans rein.-

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Bridges (Continued)

con. girder bridge over Pollys Fork Creek and 60 ft. steel truss bridge over Smiths Fork Creek, both at Lynnville, and one 24 and one 32 ft. rein.-con. girder bridges over 2 ditches at Boonville, all Warrick Co.—198 ft. steel truss bridge over Patoka Creek at Winslow, Pike Co.—five 35 ft. 1½ in. span rein.-con. girder bridge, incl. 59,000 cu.yd. approach excav. and two 32 ft. span rein.-con. bridge over Trail Creek at Michigan City, La Porte Co.

Maryland — Nov. 5, by State Roads Comn., Baltimore, G. C. Uhl, chn., concrete bridge floor, approaches for bridge, Contr. H-104-42, Harford Co.—extensions to single span rein.-con. arch bridge, Contr. M-160-311, Montgomery Co. —concrete bridge floor for bridge, Contr. H-103-47, Harford Co.; adv. E. N.-R. Oct. 30.

Maryland—Nov. 12, by State Roads Comn., Baltimore, G. C. Uhl, chn., rein.-con. girder bridge, approaches for proposed grade elimination over Pennsylvania R.R., Contr. B-110-43, Baltimore Co.—grading, timber bridges for approaches to bridge over Nanticoke River, Contr. D-68-17, Dorchester Co.—substructure alterations for bridge over Nanticoke River, Contr. F-142-57, and proposed structural steel superstructure for bridge over Monocacy River, Contr. F-161057, Frederick Co.; adv. E. N.-R. Oct. 30.

Minn., Henderson—Nov. 12, by F. Hoppenstedt, aud. Sibley Co., Gaylord, steel truss bridge over Minnesota River, on Minnesota Trunk Hy. 14, for Sibley and Le Sueur Counties. $50,000. Bridge Engineer State Hy. Dpt., St. Paul, engr. Noted July 24.

N. Y., White Plains—Nov. 12, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, stone faced rein.-con. overcrossing and 2 adjacent river bridges at Main St., Central Westchester Parkway and Connections, Contr. 316, J. Downer, ch. engr.; adv. E. N.-R. Oct. 30.

Oklahoma — Nov. 6, at office A. R. Losh, engr., State Hy. Dpt., Oklahoma City, eleven 80 ft. steel truss bridge concrete substructure over Cimarron River, on State Hy. 33, Federal Aid Project 199, north of Coyle between Payne and Logan Counties, incl. 126,060 lb. reinforcing and 814,000 lb. structural steel, 15,000 lb. steel expansion plates. State furnishes cement to contractor at cost.

South Dakota—See "Streets and Roads."

Tex., San Angelo—Tom Green Co. and State, bids about Jan. 1, rein.-con., steel vehicular bridge over Pecan Creek, on Hy. 30, 11 mi. south of here. $50,000. T. J. Kelly, San Angelo, co. engr.

Virginia — Nov. 10, by State Hy. Comn., Richmond, 97 ft. 6 in. bridge over Bakewater Creek, 42 ft. 6 in. bridge over Jennys Creek and 141 ft. 9 in. bridge over Tye River, Nelson Co. —and bridges in Lee and Buckingham Counties. $50,000. H. J. Spellman, ch. engr.

Wisconsin—Nov. 5, by State and Sauk Co. Hy. Comns., Capitol Annex, Madison, Butterfield Bridge on S.T.H. 33, F.A.P. 177, and Loganville Bridge, on S.T.H. 23 and 154, S.A.P. 1356.

CONTRACTS AWARDED

Calif., Sacramento — Sacramento Co., steel drawn span and untreated timber trestle bridge over Snodgrass Slough, to C. J. Nystedt, Capital Natl. Bank Bldg., Sacramento, $44,966.

Iowa—State Hy. Comn., Ames, five 150 x 20 ft. high truss spans with nine 50 x 20 ft. I-beam approach spans, Mehaska Co., to Ben Cole & Son, Ames, $105,947—3 span I-beam bridge, Monona Co., to A. Olson Constr. Co., Waterloo, $5,390—8 I-beam bridges, Pottawattamie Co., to Wickham Bridge & Pipe Co., 1905 West Bway., Council Bluffs, $24,600—7 box culverts, Marshall Co., to H. T. Stillman, Ames, $1,670. Grand total $137,607.

Kentucky—State Hy. Dpt., Frankfort, steel superstructure Middle Fork River Kentucky Bridge, S.P. 28 C-B, to Vincennes Bridge Co., Vincennes, Ind., $9,698; concrete substructure, superstructure, approaches, S.P. 28 C-G, to H. H. Miller Constr. Co., Jackson, $32,473, both Leslie Co. Noted Sept. 18 under "Streets and Roads."

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., triple span steel, concrete bridge, Contr. P-118-35, Prince George's Co., to Mullan Contg. Co., 3945 Greenmount Ave., Baltimore, $27,945.

New Hampshire—State Hy. Dpt., Concord, rein.-con. slab bridge, Bath, to F. W. Harris, Warner.

N. J., Bloomfield—Bd. Freeholders Essex Co., Hall of Records Bldg., Newark, steel, rein.-con. I beam bridge over 2nd River, West St., to Franklin Constr. Co., 20 Washington St., Newark, $14,375. Est. $25,000. Noted Oct. 20 Daily.

Maryland—State Roads Comn., Baltimore, repairing slab bridge over Brooks Run, Contr. Sm75-811, St. Mary's Co., to G. A. Crandall, Sudley, $3,496. Noted Oct. 9.

Ohio—R. N. Waid, dir. hys., Columbus, concrete beam bridge, Guernsey Co., to Wilmore Paving Co., Middletown, $28,994 — concrete slab bridge, Delaware Co., to B. Savage, 211 South Richards Ave., Columbus, $8,976—3 concrete bridges, Miami Co., to W. J. Fitzgerald, Lima, $31,605. Grand total $70,575. Noted Oct. 2.

O., Cleveland—Cleveland, Cincinnati, Chicago & St. Louis R.R., H. Baldwin, ch. engr., Cincinnati, 520 ft., rein.-con. bridge over West 41st St., to Industrial Constr. Co., 308 Euclid Ave. Est. $500,000. Noted Oct. 9.

O., Cleveland—Cuyahoga Co., 40 span 100 ft. rein.-con.bridge, over Big Creek, Linndale Rd., to H. J. Scott-Constr. Co., Brookpark Rd., $28,810. Est. $42,470. Noted Oct. 9.

Okla., Lawton—F. P. Aycock, clk. Comanche Co., bridge with 80 ft. steel truss and 40 ft. I-beam approach spans and bridge with 60 ft. steel truss and 92 ft. approach spans, to H. Ensley, Lawton. Noted Aug. 28.

Okla., Oklahoma City—Oklahoma Co., 4 span 180 ft. steel truss bridge on concrete piers over drainage ditch at Luther, to Dimick & Magruder, Enid, $23,450 est. $25,000—1 span 145 ft. steel truss bridge on concrete piers at Choctaw, to Boardman & Co., Maple Hawk Sts., $27,936 est. $32,000—2 span steel, concrete underpass under Frisco R.R. at Reno Ave., to Schultz Constr. Co., Ft. Smith, Ark., $50,126 est. $55,000. Grand total $101,512.

Pennsylvania — State Hy. Dpt., Harrisburg, three 154 ft. span through truss bridge with 40 ft. roadway, two 5 ft. sidewalks, Lycoming Co., to T. J. Foley Co., 1825 Cypress St., Phila., $213,679—one 160 ft. and four 174 ft. span concrete arch bridge with 22 ft. roadway, 4 ft. sidewalk, Lehigh Co., to Frank Sneed Co., Pompton Lakes, N. J., $62,634—one 81 ft., one 65 ft. and one 77 ft. span through plate girder bridge with 30 ft. roadway, two 5 ft. sidewalks, Delaware Co., to Central Penna Constr. Co., St. Marys, $165,453 — 2 concrete abutments, 3 piers for future bridge, Armstrong Co., to Foundation Co., Grant Bldg., Pittsburgh, $221,093. Grand total $662,859. Noted Sept. 18 under "Streets and Roads."

Pa., Kittanning—State Hy. Dpt., Harrisburg, J. L. Stuart, secy., bridge, truss and plate superstructure, substructure, incl. 2 concrete abutments and 3 piers over Alleghany River, to Foundation Co., Grant Bldg., Pittsburgh, $221,093. Noted July 31.

Texas—G. Gilchrist, state hy. engr., Austin, **(F.A.P. means Federal Aid Project and S.A.P. State Aid Project)**, rein.-con. bridges, F.A.P. 584-B, Brown Co., to McClung Constr. Co., 1309 Fort Worth Natl. Bank Bldg., Fort Worth, $30,275 est. $36,000—4 concrete bridges, clearing, grubbing, grading approaches, F.A.P. 580-D A, Brown Co., and steel, concrete bridges S.A.P. 931-C, Live Oak Co., to Cage Constr. Co., Taft, $66,555 and $21,316 respectively, est. $60,000 and $25,000 respectively—6 steel, concrete bridges S.A.P. 931-G, Live Oak Co., to Sanders & Hulbert, San Antonio, $107,570 est. $130,000—rein.-con. bridges, F.A.P. 569-B and S.A.P. 873-B, Navarro Co., to J. F. Buckner, 407 North Main St., Cleburne, $20,535 est. $25,000. Grand total $246,251. Noted Oct. 16.

Tex., San Antonio—City, 1 span, 70 ft. rein.-con. vehicular and pedestrian bridge over San Antonio River, at Martinez St., to J. G. Jeffrey, c/o Builders Exch., $31,039. City stopped preparation of plans for 110 ft. rein.-con., steel bridge over San Antonio River on Guilneau St., $40,000. Noted Oct. 23.

Wisconsin—State and Washington Co. Hy. Comns., Commerce Bldg., Milwaukee, Slinger Overhead, State Project 2898, to Eau Claire Eng. Co., Eau Claire, $19,712. Noted Oct. 9.

Ont., Burlington—Dpt. P. Wks., Ottawa, moving superstructure of Canadian Pacific swing bridge over Burlington Channel, to R. C. Huffman Constr. Co., 331 Bay St., Toronto, $43,000.

STREETS AND ROADS

BIDS ASKED

Arizona — Nov. 7, by State Hy. Comn., Phoenix, oil processing 15 mi. roadbed and constructing 2 bridges, Phoenix-Yuma Hy., F.A.P. 56, 2nd Reo. W. W. Lane, ch. engr.

California — Nov. 19, by State Hy. Comn., Sacramneto, grading, concrete paving 0.3 mi. road at Nojoqui Creek, Santa Barbara Co.; grading, bituminous macadam surfacing 3 mi. Alto-Waldo Rd., Marin Co. C. H. Purcell, hy. engr.

Calif., Bell—Nov. 17, by City Council, sidewalks, curbing, grading, oiled macadam and disintegrated granite sub-base paving 181,450 sq.ft. Mayflower Ave.

Calif., Long Beach—Nov. 17, by City Council, grading, c.i. pipe, concrete paving 145,000 sq.ft. Wilmington Blvd.

Calif., Los Angeles—Nov. 3, by Supervs. Los Angeles Co., grading, curbing, guttering, walks, 2 in. asphaltic concrete paving 133,000 sq.ft. Doheny Dr., County Impvt. 937; grading, 6- to 8-in. concrete paving 210,600 sq.ft. Old River School Rd., Acq. & Impvt. 17.

Calif., Oakland — Nov. 5, by Bd. Supervs. Alameda Co., improving Haywood-Redwood Canyon Rd., incl. 60,000 cu.yd. grading, 12- to 18-in. corrugated culvert pipe, 70,000 sta.yd. overhaul. C. A. Posey, Oakland, co. surv.

Calif., Santa Maria—City Council taking bids guttering, 4 in. asphaltic concrete paving 95,000 sq.ft. 3 in. oil macadam paving 53,000 sq.ft. Cypress St.

Calif., Southgate (br. Huntington Park) — Nov. 5, by City Council, grading, curbing, walks, 10-8-8 in. concrete paving 113,000 sq.ft. Tweedy Rd.

Florida—Nov. 10, by State Hy. Dpt., Tallahassee, B. M. Duncan, state hy. engr., Florida lime rock base paving 6 mi. Project 727, St. Johns Co.—concrete header curbing, cold mix asphalt resurfacing 4.72 mi. Project 883—4.86 mi. Project 885, both Duval Co.

Ind., Muncie—Nov. 4, by Bd. P. Wks., City Hall, curbing, guttering, paving west side Walnut St. 44 ft. wide leaving 6 ft. concrete island between new and old pavement. E. Carpenter, clk.

Ind., Muncie—Nov. 4, by Dpt. P. Wks., City Hall, paving alley between Walnut and Mulberry Sts., and from 12th to 13th Sts.

Ind., Muncie—Nov. 5, by City, at office Dpt. P. Wks., City Hall, combination sewer, curbing, guttering, waterbound macadam surfacing Dudley St. E. Carpenter, city clk.

Ind., Warsaw—Bd. Comrs. Kosciusko Co., bids about Dec. 1, concrete surfacing 4.5 mi. J. B. Marion Rd., 14 ft. $25,000. D. H. Lessig, Warsaw, engr.

Mass., Boston—Nov. 4, by Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt or bituluthic paving Weld St., Ward 20. $25,000.

Mass., Boston—Nov. 5, by Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt or bituluthic paving Champlain St., Ward 7; Nov. 6, Clematis St., Ward 16. $25,000 or more.

Michigan—Nov. 4, by L. N. Jones, resident engr., Crystal Falls, gravel resurfacing 5.1 mi. M031-16, Contr. 5, Houghton Co., 18 ft., for State Hy. Comn., Lansing.

Minn., Duluth—S. B. Shepard, engr. St. Louis Co., Court House, bids in November, grading, graveling 3 mi. S.A.R. 37, Project 1—grading 0.4 mi. Co. Rd. 413, Project 1—75 mi. Co. Rd. 636, Project 1—3,000 ft. Co. Rd. 29, Project 9, Sects. 13 and 24—1,800 ft. Co. Rd. 53, Project 1—0.5 mi. Co. Rd. 80, Project 2—600 ft. Town Rd. 80T—3,300 ft. Co. Rd. 158, Project 2—1.5 mi. Co. Rd. 162, Project 5—900 ft. Co. Rd. 186, Project 4—0.3 mi. Town Rd. 186, Project 1—0.5 mi. Co. Rd. 236, Project 1—0.5 mi. Town Rd. 829, Project 1—resurfacing 1 mi. Co. Rd. 29, Project 8—Co. Rd. 157, Project 3—0.75 mi. Co. Rd. 186, Project 6—graveling 0.5 mi. Co. Rd. 151, Project 4—0.5 mi. Co. Rd. 156, Project 2—1.25 mi. Co. Rd. 175, Project 3—0.5 mi. Town Rd. 245-T, Project 1—0.25 mi. Town Rd. 906, Project 1—regrading 0.7 mi. Co. Rd. 175, Project 2—constructing Bridge 263, on Co. Rd. 32, Project 1. $35,198.

Mississippi — Nov. 11, by Mississippi Hy. Comn., Jackson, light grading 4.3 mi. Laurel-Richton Rd., Jones Co.—raising fill Buttahatchie River bottom, Columbus-Aberdeen Rd., 6,600 cu.yd. borrow excav.—3,800 cu.yd. excav. in Tombighee River bottom, Columbus-Artesia Rd., 3,800 cu.yd. borrow excav., both Lowndes Co. G. A. Draper, hy. engr.

N. J., Union City—Bd. City Council, rejected bids Oct. 16, sheet asphalt paving 8th St. $60,000. H. Thourot, city engr. Noted Oct. 21 Daily.

N. J., Scotch Plains—Oct. 31, by Twp. Comn., Municipal Bldg., bituminous macadam paving 1,680 sq.yd. Coles Ave. $25,000. H. L. Paff, Forest Rd., twp. engr.

New York—Nov. 17, at office Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, grading 4.5 mi. Taconic Parkway connection of Bronx Parkway extension from Mohansic Park to Putnam Co. line, Contr. 330, J. Downer, Bronxville, Ch. engr.; adv. E. N.-R. Oct. 30.

N. Y., Brooklyn—Nov. 6, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, granite block on concrete repaving 15th and 12th Sts.—grading, curbing, asphalt on 6 in. concrete paving East 23rd St.—curbing, flagging, asphalt on 6 in. concrete paving East 55th St.—asphalt on 6 in. concrete repaving Lincoln Pl., Ross, North, 4th, 6th and 88th Sts.—grading, curbing, flagging East 48th St.

N. Y., Buffalo—Nov. 6, by G. Fisk, comr. P. Wks., Municipal Bldg., repaving (except crossings of Porter Ave., York and Vermont Sts. and space occupied by street railway tracks and 2 ft. outside on Plymouth Ave., from Hudson to Hampshire Sts.—repaving Normal Ave. from Massachusetts to Hampshire Sts. and from Porter Ave. to Vermont St.—paving Van Gorder St. W. Rathman, city engr.

N. Y., Long Island City—Nov. 3, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sheet asphalt on prepared macadam repaving Queens Rd.—sheet asphalt on concrete repaving Metropolitan and 88th Aves., 107th, 45th, 96th Sts.—grading, curbing, sidewalks, bituminous concrete on concrete paving 43rd (Kingsland) Ave. — sheet asphalt on broken stone paving 34th Ave. from Murray St. to 153rd St. and from Columbia to Betts Ave.—granite block on concrete repaving Grand St.

N. Y., New York—Nov. 6, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, draining, guard rails in Eastern Blvd. from bridge over New York, New Haven and Hartford R.R., East of Whitlock Ave. to bridge over Bronx River, and curbing, sidewalks, crosswalks from bridge over railroad to point 50 ft. west of bridg eover Bronx River.

N. Y., New York — Nov. 6, by J. Miller, pres. Manhattan Boro, Municipal Bldg., granite block on concrete repaving Jefferson and Division Sts.; 3 in. asphalt block on concrete repaving Mitchell and Beekman Pls.

N. Y., St. George—Nov. 7, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, grading, paving at West New Brighton Yard, Richmond Boro.

O., Akron—Nov. 3, by F. E. Swineford, dir. P. Serv., grading, sewers, preliminary to paving and improving 1¼ mi. Tallmadge Ave. to connect North Hill Sect. with West Hill Sect., 60 ft. $150,000. E. A. Kemmler, City Bldg., engr.

Okla., Oklahoma City—Nov. 3, by J. W. Berry, clk. Oklahoma Co., Court House, concrete on asphalt paving 12 mi. East Avenue and G Rd., 18 ft., to be let in 4 mi. sections. $190,000. J. F. Frazier, Court House, Engr.

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Streets and Roads (Continued)

New York—Nov. 6, by C. MacDonald, engr. Westchester Co., Court House, White Plains, curbing, sidewalks, paving Greeley and Washington Aves., Co. Rd. 79, in Mount Pleasant and New Castle; adv. E. N.-R. Oct. 30.

South Dakota—Nov. 13, by State Hy. Comn., Pierre, grading 13.749 mi. F.A.P. 26 and 25, Brook and Kings Counties—15.224 mi. F.A.P. 51 and 187D, Gregory Co.—26.826 mi. F.A.P. 180-F and G, Corson Co.—9.027 mi. F.A.P. 197-C, Lincoln Co.—9.988 mi. F.A.P. 230-B, Deuel Co.—3.997 mi. F.A.P. 239-B Dewey Co. —9.675 mi. F.A.P. 248-A, Washabaugh Co.— 5.983 mi. S.A.P. 209, Day Co.—graveling 5.928 mi. F.A.P. 71 and 240B, Haakon and Ziebach Counties—7.812 mi. F.A.P. 105B, Brown Co.— 17.091 mi. F.A.P. 233 A and D, Haakon Co.— 16.672 mi. Todd Co.—11.269 mi. F.A.P. 243-A, Butte Co.—8.5 mi. S.A.P. 221, Hamlin Co.— bridges on F.A.P. 180 F and G, Corson Co.— on F.A.P. 197-C, Lincoln Co. M. A. Kennedy, secy.

Tex., Austin—Travis Co., taking bids subgrade, shaping shoulders, hauling and placing gravel surfacing 8.56 mi. Menda-Kimbro Rd. and Cameron Rd., 18 ft. $31,000. O. Leonard, Austin, co. engr.

Tex., Austin—Nov. 10, by Travis Co., c/o G. S. Matthews, judge, subgrade, shaping shoulders, hauling and placing gravel surfacing 5.4 mi. New Sweden-Lund Rd., $37,000: 5.74 mi. Pflugerville-Cameron Rd., Hodde Lane and North Lund Rds., $28,000, both 18 ft. O. Leonard, Austin, co. engr.

Tex., Beaumont—Nov. 4, by City, c/o R. Edmonds, secy., permanent paving Euclid St. from Port Arthur Rd. to Southern Pacific Ry. and Avenue A from Washington to Eagle Sts. $100,000. R. C. Black, Beaumont, engr.

Tex., San Antonio—Nov. 13, by Comrs. Bexar Co., 1 in. asphalt topping 5¼ mi. Gevers St. and Palo Alto Rd. $28,000. W. S. Goodman, c/o Court House, engr.

Washington—Nov. 13, at office S. J. Humes, dir. Hys., Olympia, grading 7.5 mi. State Rd. 3, F.A.P. 132-I, Benton and Yakima Counties— 1.5 mi. State Rd. 6, McCloud Creek Revision, Pend Oreille Co.—2.1 mi. Grand Coulee Hy., Grant Co. — grading, crushed stone surfacing 0.9 mi. State Rd. 8, Skamania Co.

Washington—Nov. 18, by S. J. Humes, dir. Hys., Olympia, widening shoulders 2.2 mi. State Rd. 1, Everett South, Snohomish Co.—clearing, grading, draining 7.6 mi. State Rd. 3, Grandview to Sunnyside, F.A.P. 132-H, Yakima Co.— grading, draining 3 mi. State Rd. 8, Wishram Hill to Museum, F.A.P. 174-C, Klickitat Co.— grading, draining, surfacing 2.9 mi. State Rd. 9, Thurston-Grays Harbor County Line to Oakville, F.A.P. 179-A, Grays Harbor Co.

Wash., Seattle—Bd. P. Wks., bids about Nov. 4, paving, concrete retaining wall, 0.5 mi. 4th Ave. S., 30 ft. $40,268. R. H. Thompson, city engr.

Ont., Ottawa — Secretary Bd. Control bids about Dec. 1, asphalt paving approach to Chaudier Bridge on Ontario and Quebec sides, and repairs to bridge. $250,000. A. F. Macallum, City Hall, engr.

CONTRACTS AWARDED

Alabama—State Hy. Comn., Montgomery, W. Finnell, dir., double bituminous on sand clay surface treating 18 mi. Pike Co., to Smith Eng. Co., Jacksonville, Fla., $33,032. Noted Oct. 9.

Arizona—State Hy. Comn., Phoenix, surfacing 22.5 mi. Holbrook-Lupton Hy., F.A.P. 83-A, to B. Pearce Constr. Co., 4307 San Diego, Calif., $31,079. Noted Oct. 2.

Arizona—State Hy. Comn., Phoenix, grading, overpass and approaches 4 mi. northwest of Tucson, on Florence Tucson Hy., F.A.P. 94-G, to Hoggan & Farmer, Security Bldg., Phoenix, $29,788. Noted Oct. 16.

Arizona—State Hy. Comn., Phoenix, grading, surfacing Flagstaff-Fredonia Hy., F.A.P. 95B, to Veater & Davis, 204 Cotton Exch. Bldg., El Paso, Tex., $448,104—8.3 mi. Florence-Tucson Hy., F.A.P. 94E, to Stanley Jaicks Co., Oak Park, Ill., $75,878. Noted Oct. 2.

Ark., Russellville—Concrete repaving 13 mi., to Mobley Constr. Co., Morrillton, $42,265.

California — State Hy. Comn., Sacramento, grading, concrete paving 1 mi. road at Castaic Creek, Los Angeles Co., to Carpenter Bros., Inc., Beverly Hills, $50,546.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, curbing, concrete paving Mulholland Hy., to J. G. Donovan, 4031 Goodwin Ave., $266,332.

Calif., Santa Barbara—Santa Barbara Co., improving San Julian Rd., to W. H. West, 124 Depot Rd., $22,590. Noted Oct. 9.

Calif., Ventura—Ventura Co., 14,000 tons asphalt surfacing mixture on East 5th St., Huene and Woods Rds., to Southwest Paving Co., Washington Bldg., at $2.30 per ton.

Conn., New Britain—Paving various streets, incl. Cabot, State and Market Sts., winter program to relieve unemployment, $100,000. City builds. P. A. Merian, city engr.

Ind., Decatur—Adams Co., concrete paving William Aumann Rd., to O. W. P. Macklin, Decatur, $23,171. Est. $25,921. Noted Aug. 28.

Ind., Goshen—Elkhart Co. concrete paving 2.5 mi. County Unit Rd., 57, to Tri-Lake Constr. Co., Columbia City, $42,600. Est. $51,000. Noted Aug. 28.

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Ind., Indianapolis—Grading, sidewalks, sunken garden at Indiana World War Memorial Plaza, St. Clair to North Sts. and Meridian to Pennsylvania Sts., to American Constr. Co., 1201 East Georgia St. $251,000.

Iowa—State Hy. Comn., Ames, to A. F. McMahan, Iowa City, grading 0.242 mi. roads in Marshall Co., $2,768 — to Kibby & Foulke, Carlisle, gravel surfacing 1.64 mi. Clarke Co., $4,612—to Concrete Material Co., Waterloo, 4.8 mi. Mahaska Co., $2,280—to McDougall Constr. Co., Sioux City, 3.6 mi. Dubuque Co., $6,692; 9.6 mi. Harrison Co., $25,608; 4.4 mi. Mills Co., $10,043; 11.951 mi. Shelby Co., $14,788— to Beu & Son, Sumner, 3.2 mi. P-668, Floyd Co., $1,690; 6.5 mi. P-669, Floyd Co., $5,055— to J. R. Paul, Jefferson, 8 mi. Greene Co., $7,544—to Hartzell & Teepell, Early, 12 mi. Sioux and Lyons Counties, $4,005—to F. W. Guenther, Burlington, riprap in Lee Co., $4,440 —to G. Conkrite, Perry, 64,900 lin.ft. cable guard rail in Dist. 3, $14,956. Grand total $104,481.

Ia., Ottumwa—Warrenite asbestos paving 10,500 sq.yd. Market and Main Sts., to J. C. Blunk Constr. Co., Ottumwa.

Kansas—State Hy. Comn., Topeka, at Court House, Dodge City, regraveling 6 mi. Project 7107 and 6 mi. Project 7102, Doniphan Co., to D. Scherrer, 329 North 18th St., Kansas City, $1,880 and $1,770 respectively—4.6 mi. Riley Co., to Reed & Wheelock, Clay Center, $2,263 —3 mi. Lyons Co., to McMillen & Furman, Emporia, $1,381—3 mi. Leavenworth Co., to Collins Constr. Co., Leavenworth, $1,644—grading, culverts, 6.188 mi. Osage Co. and 2.353 mi. Lyons Co., to Geiger & Rutherford, Leavenworth, $51,533 and $14,541 respectively — bridge at Station 179 plus 37.75, Lyons Co., to A. L. Cook, Ottawa, $15,830—bridge at Station 334 plus 00, Lyons Co., to B. Metzger, Ozawkie, $1,931. Grand total $93,653.

Kan., Kansas City—To T. P. Thompson, 3908 Forest St., paving Haskell St. $16,000, Ann Ave. $8,610, 8th St. $12,730. Grand total $37,360.

Kan., Mound City—Linn Co., chats surfacing Mound City-Blue Mound Rd., to Thogmartin & Reis, Ft. Scott, $17,114—Pleasanton-State line Rd., to Cook & Cone, Ottawa, $6,540—Lacygne-Parker Rd., to A. G. Sherwood, Independence, $18,735. Grand total $42,389.

Kentucky—State Hy. Dpt., Frankfort, retread surfacing, using light tar and asphalt cutback, 10.6 mi. Hodgenville-Bardstown Rd., State Project 3-CS, Larue Co., to R. B. Tylor & Co., 1446 Levering St., Louisville, $86,885.

Kentucky—State Hy. Dpt., Frankfort, grading, using 1st class rein.-con. pipe 12.151 mi. roads in Barren Co., to Jenkins Constr. Co., Elizabethtown, $83,801—4.512 mi. Caldwell Co. and 5.865 mi. Union Co., to Frazer & Cocke, Wickliffe, $22,494 and $56,148 respectively—10.641 mi. Edmonson Co., to Campbell & Co., Bowling Green, $52,767—8.857 mi. Pulaski Co., to M. P. Smith Constr. Co., Yosemite, $62,612—6.391 mi. Trimble Co. and rein.-con. paving, using 1st class rein.-con. pipe 10.212 mi. Bath Co. to Irvine Constr. Co., Irvine, $109,976 and $286,901 respectively—grading, drainage structures, using 1st class rein.-con. pipe 1.815 mi. Hardin Co. and traffic bound limestone surfacing 7.867 mi. Nelson Co., to J. B. Westerfield, Owensboro, $7,142 and $93,291 respectively—7.194 mi. Madison Co., to Kaiser Transportation Co., Beuchel, $31,942—grading, traffic bound limestone surfacing 11.114 mi. Warren Co., to H. F. Mathis, Bardstown, $81,760—bank gravel surfacing 4.281 mi. Graves Co., to N. E. Stone & Co., Madisonville $9,227—8.977 mi. Livingston Co. and 6.015 mi. Lyon Co., to Corum Bros., Madisonville, $27,750 and $18,213 respectively. Grand total $944,025. Noted Sept. 18.

Maryland—State Roads Comn., Baltimore, concrete paving 0.9 mi. Contr. D-66-12, Dorchester Co., to Layfield & Waller Paving Co., Salisbury, $16,195; sheet asphalt paving 0.46 mi. Contr. BC-97-72, Baltimore City, to American Paving & Contg. Co., Montebello Ave., Baltimore, $25,111. **Noted Oct. 9.**

Maryland—State Roads Comn., Baltimore, concrete paving 0.08 mi. Contr. G-62-63, Garrett Co., to Brady Bros., Frostburg, $5,886. Noted Oct. 9.

Maryland — State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 1 mi. Contr. S-45-14, Somerset Co., to Hannemann-Burroughs Co., Salisbury, $18,031. Noted Sept. 11.

Massachusetts—Dpt. P. Wks., Boston, bituminous macadam paving 2,600 ft. hy. Lenox, to Lane Constr. Corp., 134 State St., Meriden, Conn., $15,242; graveling 1,850 ft. Mendon, to D. G. DiPietro, Box 38, Bellingham, $3,789. Noted Oct. 16.

Massachusetts—Dpt. P. Wks., Boston, bituminous macadam paving 6,000 ft. hy. Palmer, to C. E. Horne, Millbury, $24,275. Noted Oct. 9.

Mass., Boston—Dpt. P. Wks., bithulithic paving Frawley and Stockwell Sts., to A. G. Tomasello, 250 Stuart St. Est. $250,000. Noted Oct. 9.

Mass., Boston—Dpt. P. Wks., sheet asphalt paving Brier Rd., Wycliff Ave., West Roxbury, to J. P. Shaughnessey, 544 Hyde Park Ave., West Roxbury. Est. $25,000. Noted Oct. 9.

Mass., Malden—Warrenite bitulithic paving 16,000 sq.yd. to Warren Bros. Roads Co., 38 Charles River Rd., Cambridge. Est. exceeds $25,000.

Mississippi—State Roads Comn., Jackson, to Hartman-Clarke Bros., 920 Peoria Life Bldg., Peoria, Ill., improving roads in Hinds Co., $247,351; U. S. Rd. 49, Madison Co., $72,333; U. S. Rd. 51, Madison Co., $200,319—to H. E. Pigford, Russell, Lauderdale Co., $139,672—to Cobb Bros., Hazelhurst, Jones Co., $129,083— to Sullivan-Long & Haggerty, Bessemer, Ala., Leflore Co., $151,528. Grand total $940,286. Noted Oct. 7.

Nebraska — State Hy. Dpt., Lincoln, and Adams Co. (Hastings) 1 mi. concrete paving F.A.P. 39-B, to Roberts Constr. Co., 404-5 1st National Bank Bldg., Lincoln, $30,686; 1 mi. S.A.P. 669-A, to Mid-State Constr. Co., Hastings, $22,712.

Neb., Ogallala — Grading, concrete paving Federal Aid Project 320, to Yant Constr. Co., Omaha Natl. Bank Bldg., Omaha, $22,474.

N. J., East Rutherford (mail Rutherford)— Bd. Boro Council, Boro Hall, Oct. 20, sheet asphalt paving Park Ave. from Main St. to Paterson Ave., to Union Building & Constr. Co., 342 Bway., Passaic, at $1 per sq.yd.

N. J., Elizabeth—Bd. Freeholders Union Co., Court House, rein.-con. paving East Milton Ave., to C. H. Winans Co., 207 Broad St., $29,197. Est. $35,000. Noted Oct. 9.

N. Y., Beacon — Commissioner Correction, State Office Bldg., Albany, bituminous macadam road at Matteawan State Hospital, to J. DeNichols Bros., 58 High St., Torrington, Conn., $15,456. Est. $29,342. Noted Oct. 2.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., asphalt block repaving East 148th St., to C. D. Beckwith, Edgewater Rd. and Seneca Ave., $17,445 — grading, curbing Revere Ave., to Gramaglia Bros., 5037 Fieldston Rd., $12,147 —sewer in Magenta St., to Caserta Constr. Co., 2442 Barnes Ave., $2,700. Grand total $32,292. Noted Oct. 9.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, grading, bituminous paving Garretson Ave., to C. M. Bristow, Lyndhurst, N. J., $5,155; sidewalks on Metropolitan Ave., to Seaboard Constr. Co., $3,445. Noted Oct. 9.

North Carolina — State Hy. Comn., Raleigh, widening 0.84 mi. hy. Alamance Co., to Cobb & Homewood, Chapel Hill, $6,393—2.11 mi. Rowan Co., and 2.51 mi. Union Co., to Blythe Bros., Charlotte, $37,448 and $22,237 respectively—paving 3.01 mi. Gaston Co., to Guilford Constr. Co., Greensboro, $65,201 — 4.89 mi. Jones Co., to Murray Constr. Co., 508 Union Ave., Knoxville, Tenn., $73,518 — 14.65 mi. Lenoir Co., to West Constr. Co., Volunteer Life Bldg., Chattanooga, Tenn., $211,242 — grading 13.22 mi. Moore Co. and 6.24 mi. Stanly Co., to L. J. Smith, Asheville, $45,729 and $34,190 respectively—0.82 mi. New Hanover Co., to P. R. Ashby & Co., Raleigh, $16,093 — concrete bridges Columbus Co., to J. D. Orrell, Wilmington, $11,652—concrete, steel bridge New Hanover Co., to T. A. Loving Co., Goldsboro, $89,941—concrete bridges Moore Co., to Hobbs-Peabody Constr. Co., 1902 Dilworth Rd., Charlotte, $14,512. Grand total $628,156. Noted Sept. 25.

Ohio—R. N. Waid, dir. Hys., Columbus, grading, drainage structures, 0.592 mi. Carroll and Harrison Counties, to Massillon Constr. & Realty Co., Massillon, $21,474—concrete paving 0.488 mi. Columbiana Co., to Kelley & Meyer Co., 1509 Market St., Youngstown, $17,992—2.31 mi. Franklin Co., to Davis & Davenport Constr. Co., Spencerville, $148,675—1.051 mi. Hamilton Co., to Wilmore Paving Co., Middletown, $84,476—brick paving 1.047 mi. Franklin Co., to W. H. Ringwald & Sons Co., Chillicothe, $103,103—brick paving, incl. furnishing, delivering brick, 0.183 mi. Scioto Co., to Kelley Bros. Constr. Co., Portsmouth, $17,285. Grand total $393,005. Noted Oct. 2.

O., Cleveland — Vitr. brick widening pavements at 11 safety zones, to Rieley Bros., The Arcade, $29,497.

O., Cleveland—Bd. Comrs. Cuyahoga Co., Oct. 18, vitr. brick paving 2,450 sq.yd. S.O.M. Center Rd. at Erie R.R. Grade Elimination, from Loesch & Green Constr. Co., 4169 Pearl Rd., $22,530. Est. $28,400. Noted Oct. 15 Daily.

Okla., Oklahoma City — Oklahoma Co., to Western Paving Co., Petroleum Bldg., sheet asphalt paving 11,710 sq.yd. Eastern Avenue Rd., $18,382 est. $25,000; 43,079 sq.yd. North May Avenue Rd., $66,045 est. $80,000; 17,300 sq.yd. East Britton Rd., $26,701 est. $35,000; 69,248 sq.yd. West Tenth Street Rd., $106,881 est. $125,000. Grand total $218,009. All bids rejected improving 10 mi. East G Avenue Rd. Will readvertise. J. P. Frazier, Court House, engr. Noted Oct. 9.

Okla., Oklahoma City—Widening 5 blocks 17th St., 56 ft., to Western Paving Co., Petroleum Bldg., $22,970. Est. $25,000.

Okla., Oklahoma City—Grading, paving 9 blocks 12th St., to Western Paving Co., Petroleum Bldg., $67,062 est. $72,000—4 blocks 3rd St. and 6 blocks South 28th St., to Earl W. Baker & Co., Perrine Bldg., $20,871 and $27,133 respectively, ests. $25,000 and $30,000 respectively. Grand total $115,066.

Okla., Tulsa—E. Logan, city aud., widening, sheet asphalt paving 16,100 sq.yd. 2nd St., to Standard Paving Co., 2119 East 11th St., $73,544. Est. $77,000.

Okla., Tulsa—Widening 6 blocks Peoria St. from Pine to Virgin Sts., 36 ft., to Calumet Constr. Co., 209 South Nogales St., $27,308. Est. $28,000.

Pennsylvania — State Hy. Dpt., Harrisburg, rein.-con. surfacing 2,000 ft. road in Lehigh Co., 18 ft., and 5,204 ft. Bucks Co., 20 ft., to W. Eisenberg & Sons, Income Insurance Bldg., Camden, N. J., $12,641 and $58,368 respectively—6,282 mi. Erie Co., 20 ft., to Lewis & Copeland, Lima, O., $73,567—3,300 ft. Beaver Co., 20 ft., to Rinehart Bros., East Liverpool, O., $71,103—13,598 ft. Butler Co., 18 ft., to Lincoln Constr. Co., Youngstown, O., $115,240 —1,493 ft. Blair Co., 27, 30 and 36 ft., to E. E. Stoll, Altoona, $24,196—3,029 ft. Chester Co., 18 ft., to Dalton Bros., Paoli, $22,767—

Streets and Roads (Continued)

16,800 ft. Allegheny Co., 18 and 30 ft., incl. 4 bridges, to M. Volpe, West New York, N. J., $360,001—bituminous surface treated macadam surfacing 5,383 ft. Lancaster Co., 18 ft., to H. R. Miller, Lancaster, $36,490—5,109 ft. Cumberland Co., 18 ft., to L. M. Hutchison, Orbisonia, $22,309. Grand total $796,682. Noted Oct. 1.

Pa., Phila.—Bureau Hys., Dpt. P. Wks., City Hall Annex, to Municipal Eng. Co., Washington Square Bldg., asphalt paving (assessment work) Foust St. from Charles to Aramingo Sts., $19,720; Godfrey St. from Ogontz & Bouvier Sts., $10,902; Limekiln St. from Walnut to Washington Sts., $12,926; Tulip St. from Levick to South Sts., $2,421; asphalt repaving Carpenter St. from Broad to 15th Sts., $3,617—to Montgomery Paving Co., Harrison Bldg., asphalt paving (assessment work) Marsden St. from Levick to Hellerman Sts., $3,589; Rising Sun St. from Devereaux St., to Martins Hill Rd., $42,527; Summerdale St. from Cheltenham to Oxford Sts., $8,913—to Union Paving Co., Broad and Stiles Sts., improvement (asphalt paving, assessment work) Olney St. from Wister to 20th Sts., $21,346; Walnut St. from 39th to 40th and 41st to 43rd Sts., $23,501—to M. and J. B. McHugh, 892 North Markoe St., furnishing, laying water pipe in Olney Ave. from Wister to 20th Sts., $5,050—to Footway Paving Co., 202 North Simpson St., furnishing and setting granite curbing on north side Winter St. from Van Pelt to 22nd Sts., $563. Grand total $155,075.

Texas—G. Gilchrist, state hy. engr., Austin, grading, drainage structures 6.328 mi. Madison Co., to W. M. Forrest, Midway, $29,891 est. $40,000 — 11.896 mi. Bee and San Patricio Counties, to F. P. McElwrath, Box 727, Corsicana, $48,838 est. $74,000 — 4.833 mi. Liberty Co., to C. C. Deal, Waller, $32,999 est. $36,000—19.599 mi. Brown Co., to McClung Constr. Co., 1309 Fort Worth Natl. Bank Bldg., Fort Worth, $94,229 est. $120,000, all 26 ft. wide. Grand total $205,957. Noted Oct. 16.

Texas—G. Gilchrist, state hy. engr., Austin, grading, gravel surfacing 15.206 mi. hy. Hopkins Co., to Dexter Constr. Co., Hangar 10, Love Field, Dallas, $65,843 est. $80,000—limestone rock asphalt on concrete paving 5.23 mi. Nueces Co., to Brown & Root, Inc., P. O. Box 745, Austin, $106,767 est. $120,000, both 18 ft. wide—grading, drainage structures 3.982 mi. Navarro Co., to J. F. Buckner, 407 North Main St., Cleburne, $25,152 est. $38,000—2.934 mi. Harris Co., to J. D. George, Donna, $53,293 est. $64,000, both 26 ft. wide. Grand total $251,055. Noted Oct. 16.

Texas—G. Gilchrist, state hy. engr., Austin, grading, drainage structures 7.311 mi. hy. Panola Co., 26 ft., to T. C. Drew, Menden, La., $55,163, est. $68,000; concrete paving 3.896 mi. hy., Van Zandt Co., 18 ft., to Dexter Constr. Co., Hangar 10, Love Field, Dallas, $84,693 est. $100,000. Noted Oct. 16.

Tex., Barreda—James-Dickinson Co., c/o A. D. Dickinson, Jr., El Jardin Hotel, Brownsville, grading roads on large tract of land and dredging lake near club house, to J. Benito, Barreda, $28,000.

Tex., Borger—For 2 in. cold penetration on natural base paving 16,870 sq.yd., to Zempter Constr. Co., Fisk Medical & Professional Bldg., Amarillo, $34,760. Est. $35,000.

Tex., El Paso—Paving small portion Dover St. and bridge on Dover St., to West Texas Constr. Co., El Paso, $31,042.

Tex., San Antonio — Paving, extending 3 blocks Elm St. from Houston to Commerce Sts., 60 ft., own forces, $105,000. I. Ewig, city engr.

Tex., San Antonio—For 1½ in. cold rolled asphalt on macadam paving 6 blocks Shook Ave., to Alamo Paving Co., 321 Dawson St., $30,000. Noted Sept. 25.

Tex., San Antonio—Comrs. Bexar Co., grading, graveling ¼ in. natural limestone rock asphalt paving 1.9 mi. St. Cloud Rd. and Woodlawn Dr., to Alamo Paving Co., 321 Dawson St., $13,022 and $9,050 respectively. Noted Sept. 18.

Utah—State Rd. Comn., Salt Lake City, grading, surfacing 9.185 mi. Midland Trail from Thompson to Cisco, Grand Co. to W. W. Clyde Co. & J. W. Whiting, Springville, $93,394. Est. $116,038.

Virginia—State Hy. Dpt., Richmond, grading, one course macadam surfacing 1.058 mi. roads in Augusta Co., to M. T. McArthur, Johnson City, $27,181 — clearing, grubbing, widening, concrete surfacing 3.124 mi. Princess Anne Co., to Tunstall-Johnson Co., Inc., Norfolk, $36,225—40 ft. rein.-con. beam span bridge over Powell Creek, Prince George Co., to Fredericksburg Bridge Co., Fredericksburg, Va., $17,992. Grand total $81,398. Noted Oct. 1.

Virginia—State Hy. Comn., Richmond, grading, drainage structures, macadam with black top surfacing, 1.162 mi. road in Henrico Co., to R. Lassiter, Raleigh, N. C., $34,566. Noted Oct. 8.

Washington—S. J. Humes, dir. Hys., Olympia, grading 2. 4 mi. road in Kittitas Co., to Rowland Constr. Co., 5237 East Marginal Way, Seattle, $62,561; crushed stone surfacing 7.3 mi. Okanogan Co., to Halleran Bros., 3252 Bway., N., Seattle, $75,310. Noted Oct. 2.

Wash., Seattle — Bd. P. Wks., paving 6th Ave. N. W., to Fiorito Bros., 3950 6th Ave. N. W., $103,904.

Wis., Milwaukee—Dept. P. Wks., to Beech Constr. Co., 1537 Sherman Blvd., paving alley between North 54th and North 55th Sts., $346—G. W. Hirth, Inc., 719 Chambers St., unnamed street, $268—to J. C. Bluhm & Son, 1299 Achilles Ave., North Sherman Blvd., $26,950; North 31st St., $9,309; West Hampton Ave., $13,674—to Czerinski Constr. Co., 816 Clinton St., South Pine Ave., $47,456. Grand total $98,004. Noted Oct. 15.

Ont., Toronto—Asphalt on concrete paving Fleet St., to Godson Contg. Co. Ltd., 203 Richmond St. W., $37,662—to Glenforest Rd., to Constructing & Paving Co. Ltd., Confederation Life Bldg., $8,175—concrete paving three lanes, to L. P. Acri, 28 Grove Ave., $7,282. Grand total $53,116.

Que., Hull — Asphalt paving, to Standard Paving Co. Ltd., Elgin St., Ottawa, Ont., $80,819.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ark., Little Rock—Pulaski Co., c/o W. F. Sibeck, judge Pulaski Co., and Citizens Com., c/o F. Rossner, 315 West Markham St., preliminary plans drainage canals in Fourche Bayou Bottoms, installing flood-gates at mouth of bayou, involving 70,000 acres. G. Douglas, Home Insurance Bldg., engr.

Okla., Cordell—Washita Co. drainage work in Washita River Valley, east of here. $27,000. F. Ford, Cordell, engr.

Ont., Riverside—Concrete breakwater, $150,000. A. Reid, Town Hall, engr.

BIDS ASKED

Ont., Ottawa—See "Contracts Awarded."

La., Ponchatoula—Nov. 12, by Bd. Comrs. Gravity D.D. 2, Tangipahoa Parish, c/o P. Drake, pres., 1,030,000 cu.yd. dragline excav., 800 acres clearing in drainage channels and cleaning natural stream channels, also constructing bridges, incl. 180,000 ft. lumber and 7,000 ft. piling, E. G. Freiler, Hammond, engr.

La., Ponchatoula—Nov. 14, by Bd. Comrs. Tangipahoa D.D. 1, Tangipahoa Parish, 445,000 cu.yd. dragline excav., 180 acres clearing, E. G. Freiler, Hammond, engr.

Ont., Algoma — Nov. 4, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, breakwater-wharf at Cockburn Island, $20,000.

N. Y., Brooklyn—Nov. 6, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, dredging Fresh Creek Basin, Paerdegat Basin and in Hendrix Street Outlet Channel.

CONTRACTS AWARDED

Ark., Blytheville — Mississippi Co., capping, strengthening levee along eastern side Big Lake, to O. Kotchitsky, Blytheville, $29,000.

Calif., Fair Oaks—Fair Oaks Irrigation Dist., furnishing, installing 2,000 ft. 30 in., 10 gage, and 2,000 ft. 12 in. steel pipe, to Sacramento Pipe Wks., 16th St. and Nor. Blvd., at $3.30 and $0.89 per ft. respectively. Noted Oct. 1.

Calif., Merced—Merced Irrigation Dist., furnishing, installing 3 drainage pumps, motors, to Byron-Jackson Pump Co., 6th and Carlton Sts., Berkeley, $3,000.

Iowa — Woodbury Co. (Sioux City), W. L. Eagan, aud., and Monona Co. (Onawa), W. Ropes, aud., cleaning out 11 mi. Woodbury-Monona Drainage District Ditch, incl. 549,000 cu.yd. wet earth excav., to P. Zetz, 2512 West Jackson St., $29,097. Est. $50,000. Noted May 1.

Tex., Barreda—See "Streets and Roads."

B. C., Nelson—West Kootenay Power & Light Co., Rossland, 350,000 cu.yd. rock excav. and removing boulders and gravel above Corra Linn Falls and power development scheme on Kootenay River, removing boulders and gravel, to Dutton & Grant, Winnipeg, Man., $150,000; rock work, to General Constr. Co. Ltd., Granville Island, Vancouver, $350,000.

Ont., Ottawa—Dominion Govt., rein.-con. retaining wall on south bank Rideau Canal, day labor, $150,000. K. M. Cameron, Ottawa, engr.

Ont., Port Arthur—Dpt. P. Wks., Parliament Bldgs., Ottawa, additional section Port Arthur breakwater, to Chambers McQuigge & McCaffery Co. Ltd., Excel Life Bldg., Toronto, $250,000.

Que., Sorel—Dpt. P. Wks., Parliament Bldgs., Ottawa, Ont., dredging, to Les Chantiers Manseau Ltd., Sorel, $37,625.

Public Bond Elections

Coming Bond Elections

Waterworks—St. Paul, Minn., Nov. 4, $100,000.
Waterworks—Clarkton, Mo., Nov. 11, $20,000.
Waterworks—Gulman City, Mo., $60,000.
Sewers—Richmond, Ind., $150,000.
Sewers—St. Paul, Minn., Nov. 4, $100,000.
Sewers—Wichita, Kan., Nov. 4, $50,000.
Sewage Disposal Plant—Wichita, Kan., Nov. 4, $500,000.
Court House—Hays, Kan., Nov. 4, $210,000.
High School—Irwin, Pa., Nov. 4, $250,000.
Jail—Abilene, Tex., Taylor Co., Nov. 4, $100,000 to $150,000.
School—Irwin, Pa., Nov. 4, $250,000.
Schools—Sacramento, Calif., $2,000,000.
Grade Crossings, etc.—Los Angeles, Calif., Nov. 4, $1,330,000.

Bonds Voted

Waterworks—Mangum, Okla., H. T. Lawrence, Mangum, engr., $108,000.
Sewers — Watertown, S. D., W. F. Cochrane, city engr., $225,000.

Bonds Defeated

High School—Hugoton, Kan., $175,000.

FEDERAL GOVERNMENT

PROPOSED WORK

California — BREAKWATER — U. S. Eng. Office, 751 South Figueroa St., Los Angeles, extending 12,500 ft. concrete caisson type breakwater between Los Angeles and Long Beach incl. 125 caissons, concrete boxes 100 ft. long, 50 to 60 ft. high, 35 ft. wide at top sloping up from 60 ft. base, a superstructure will be built on top to permit jetty to protrude 14 ft. above mean low tide.

California—WEIR—U. S. Eng., California Fruit Bldg., Sacramento, 500 ft. rein.-con. weir, incl. two 40 ft. abutments, at Moulton Landing, Colusa Co.

Colorado—ROAD—Pub. Rds., Dpt. Interior Natl. Park Service, Denver, bids early in 1931, 2 courses crushed rock or crushed gravel and oil top surfacing 7.43 mi. Project 1-A, B, C and D, North and South Hy., Mesa Verde Natl. Park, Montezuma Co. A. E. Palen, acting dist. engr.

Mass., Andover—POST OFFICE—Treas. Dpt. at office Sup. Archt., post office.

Minnesota — DREDGING — U. S. Eng., St. Paul, 330,000 cu.yd. in Mississippi River vicinity.

Missouri—DIKE—U. S. Eng., Kansas City, 8,180 ft. standard pile clump dikes, 1,640 ft. crib dikes, and 10,000 ft. revetment at Sheepsnose and Berlin Bends; and 6,690 ft. dike at Berlin Bend in Missouri River, near Kansas City.

Mo., Jefferson City—POST OFFICE—Treas. Dpt. at office Sup. Archt., 3 story, basement, concrete, brick, steel, High and Washington Sts., $450,000.

Montana—ROAD—Pub. Rds., W. H. Lynch, dist. engr., Post Office Bldg., Portland, Ore., bids in spring, grading 4.5 mi. Transmountain Hy., Glacier Natl. Park.

N. Y., Jamaica—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, 164th St. and Shelton Ave.

Oregon—ROAD—Pub. Rds., W. H. Lynch, dist. engr., Post Office Bldg., Portland, bids in spring, grading 3.5 mi. road in Crater Lake National Park, Klamath Co.

Pa., Pittsburgh—MANEUVER BOATS—U. S. Eng., 3 steel maneuver boats.

R. I., Newport—HOSPITAL, etc.—Yards & Docks, Navy Dpt., 2 hospital wings and nurses home, at U. S. Naval Hospital.

S. C., Spartanburg—POST OFFICE—Treas. Dpt. at office Sup. Archt., soon takes bids post office and federal building. Noted Oct. 9.

Texas—DREDGING—U. S. Eng., Galveston, 8,830,000 cu.yd. in Louisiana-Texas Waterway, Jefferson and Chambers Co.

Tex., El Paso—PRISON—Dpt. Justice, S. Bates, supt. Prisons, plans by Trost & Trost, Two Republics Bldg., 2 story, part basement, brick, rein.-con federal prison, plain found.

Utah, Salt Lake City—HOSPITAL—Vet. Bu. preliminary plans U. S. Veterans Hospital.

Washington — ROAD — Pub. Rds., W. H. Lynch, dist. engr., Post Office Bldg., Portland, Ore., bids in spring, grading 1.5 mi. road Pierce Co., and 3 mi. West Side Hy., Pierce and Washington Counties, both in Mount Rainier Natl. Park.

Wyoming—ROAD—Pub. Rds., Custom House, Denver, Colo., bids early in 1931, 2 courses crushed rock or crushed gravel with oil top surfacing 24 mi. Project 1-A-2, 1-B, and 1-C-1, Obsidian Cliff-Firehole Cascades, Grand Loop National Park Hy., and oiling 16 mi. Project 5-A, B and C, East Entrance Hy., both in Yellowstone Natl. Park.

Wyo., Fort Warren—QUARTERS—Con. Q.M., Fort, Francis E. Warren, will probably reject bids received Sept. 22, as all were above appropriation constructing 4 company officers quarters. Noted Aug. 22.

BIDS ASKED

Ark. Hot Springs—HOT WATER COLLECTING and DISTRIBUTION SYSTEM—Nov. 24, at office Dpt. Interior, Field Headquarters, Natl. Park Serv., 409 Underwood Bldg., San Francisco, Calif., hot water collecting and distributing system, for Hot Springs National Park; adv.: E. N.-R. Oct. 30.

Calif., San Francisco—WATER SOFTENER • Nov. 7, by Con. Q.M., Fort Mason, furnishing, installing water softener, at Letterman General Hospital Power Plant.

Ind., Fort Benjamin Harrison—QUARTERS—Nov. 25, at office Con. Q.M., 3 double sets non-commissioned officers quarters; adv. E. N.-R. Oct. 30.

Mass., Fall River—ELEVATOR—Nov. 6, by Treas. Dpt. at office Sup. Archt., freight elevator in post office.

Neb., Crete—POST OFFICE—Nov. 25, by Treas. Dpt., at office Superv. Archt., constructing U. S. Post Office; adv. E. N.-R. Oct. 30.

N. M., Carlsbad—ELEVATOR SHAFT—Nov. 25, by Dpt. Interior, Field Headquarters, Natl. Park Serv., Underwood Bldg., San Francisco, Calif., elevator shaft at Carlsbad Caverns Natl. Park; adv. E. N.-R. Oct. 30.

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Federal Government (Continued)

N. Y., Brooklyn—CABLE—Nov. 21, by Signal Supply Officer, Signal Sect., New York General Depot, 58th St. and 1st Ave., cable.

N. Y., Mineola — QUARTERS — Dec. 2, at office Con. Q.M. Mitchel Field, 13 double sets non-commissioned officers quarters, at Mitchel Field; adv. E. N.-R. Oct. 30.

O., Dayton—FIRE STATION—Nov. 21, at office Con. Q. M. Wright Field, fire station at Wright Field.

Utah—ROAD—Nov. 3, by Pub. Rds., Ogden, grading 8.351 mi. Widtsoe-Bryce Canyon Natl. Forest Rd., Powell Natl. Forest, Garfield Co. B. J. Finch, Ogden, dist. engr.

Wash., Fort Lewis—NURSES' QUARTERS—Nov. 18, at office Con. Q. M., nurses' quarters; adv. E. N.-R. Oct. 28.

CONTRACTS AWARDED

Ark., Eldorado—ELEVATOR PLANT—Treas. Dpt. at office Superv. Archt., elevator plant, to Otis Elevator Co., 810 18th St. N. W., Wash., D. C. $18,947.

Calif., San Diego—WHARF—Spec. 6141—Yards & Docks, Navy Dpt., quay wharf and marine railway, to R. T. Dawson, San Diego, $14,951.

Colorado—ROAD—Pub. Rds., Custom House, Denver, grading 5.089 mi. Black Mesa Natl. Forest Rd., Gunnison Natl. Forest, Gunnison Co., to A. R. Mackay, Fort Morgan, $75,157—4.993 mi. Rabbit Ears Pass Natl. Forest Rd., Routt Natl. Forest, Grand and Jackson Counties, to Utah Constr. Co., Ogden, Utah, $81,653—4.463 mi. Berthaud Pass Natl. Forest Rd., Arapahoe Natl. Forest, Grand Co., to E. H. Hannen Colorado Springs, $117,703. Grand total $274,513.

Colorado—ROAD—Pub. Rds., Custom House, Denver, grading 2.12 mi. Six Mile Creek Natl. Forest Rd., Pike Natl. Forest, Jefferson and Douglas Counties, to Cook & Ransom, Ottawa, Kan., $63,088. Noted Oct. 20 Daily.

D. C., Wash.—GRADING—Arlington Memorial Bridge Comn., Navy Bldg., grading parkway to entrance National Cemetery in connection with Arlington Memorial Bridge, to W. F. Brenizer, 101 New York Ave. N. E., $27,132. Noted Sept. 15.

Idaho—ROAD—Pub. Rds., Ogden, Utah, grading, surfacing 5.402 mi. Salmon-Montana Line Natl. Forest Rd., Lemhi Co., to C. and F. Teaming & Trucking Co., Butte, Mont., $34,402. Est. $37,682

Louisiana—LEVEE—U. S. Eng., River and Prytania St., New Orleans, improving south bank Red River, in Second New Orleans Dist., to Kenyon Howard Dredging Co., 3603 McKinney St., Houston, Tex., $79,608. Noted Sept. 4 Daily.

Miss., Gulfport — SEWAGE DISPOSAL PLANT — Vet. Bur., sewage disposal plant, at U. S. Veteran's Hospital, to Sanford Bros., Inc., 301 Washington Ave., Montgomery, Ala., $85,600. Noted Sept. 11.

N. Y., Buffalo—RETAINING WALL—U. S. Eng., retaining wall, Black Rock Lock, to Amer. Constr. & Dredging Co., Marion Bldg., Cleveland, O., $42,494. Noted Sept. 11.

N. Y., New York—ASSAY OFFICE—Treas. Dpt. at office Sup. Archt., constructing U. S. Assay Office, to Great Lakes Constr. Co., 333 North Michigan Ave., Chicago, Ill., $1,673,292. Noted Aug. 14.

Oregon—ROAD—Pub. Rds., Portland, heavy grading 4.935 mi. Roosevelt Coast Hy., Lane Co., to Kern Kibbie, 290 East Salmon St., Portland, $440,929.

RAILWAYS

PROPOSED WORK

Massachusetts—F. R. Hayward, Meetinghouse Rd., Orleans, marine railway and timber pier in Orleans, $25,000 or more. Private plans.

Missouri—Missouri-Kansas-Texas R.R. Co., F. Ringer, ch. engr., St. Louis, expending $7,000,000, extensions and improvements, during 1931, incl. superstructure new bridge across Missouri River at Boonville, installing heavier rails at various points, replacing timber trestles with rein.-con. structures, additional automatic signals.

Texas—Gulf, Colorado & Santa Fe Ry. Co., F. Merritt, ch. engr., Galveston, soon takes bids rein.-con., structural steel, brick railway shops, Cleburne. Interested contractors should communicate with owner at once.

Ontario—Toronto Transportation Comn., 35 Yonge St., Toronto, 5 mi. double track laid on concrete on granite paving in Weston and Davenport Rds., Dundas, Church and Jarvis Sts. in Toronto. $2,000,000. W. E. P. Duncan, Toronto, engr.

CONTRACTS AWARDED

New York—Div. Standards & Purchase, Capitol, Albany, steel trestle and spur tracks, at New York State Hospital for Treatment Incipient Pulmonary Tuberculosis, Raybrook, to L. E. Stiles, Canton, $14,989. Noted Sept. 18.

New York — New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, signal station in connection with elimination of Austin, Amherst and Tonawanda Street Crossings, in Buffalo, to Hecker-Moon Co., 8701 Union St., Cleveland, O., $27,593. Est. $48,052.

Pennsylvania — Baltimore & Ohio R.R. Co., Baltimore, Md., H. A. Lane, ch. engr., second track construction, placing pipe culvert, grading, drainage structures 2 mi. between Bruceton and Snowden, to Empire Constr. Co., 31 South Calvert St., Baltimore, Md.

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SUBWAYS AND TUNNELS

PROPOSED WORK

Ont., St. Thomas—City and Elgin Co. constructing subway and cutting down Fingal Hill. $150,000. A. Bell, Court House, engr.

BIDS ASKED

N. Y., New York—Nov. 7, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., enclosures at Canal Street Station of Bway.-4th Ave. Rapid Transit Railroad, Agreement "JW."

B. C., Vancouver—Canadian Pacific Ry., J. M. R. Fairbairn, ch. engr., Montreal, Que., bids about Dec. 1, 4,609 ft. tunnel 16-19 ft. wide, 22.5 ft. high, concrete lined, from Thurlow St. on Burwood inlet to Georgia St. Viaduct on False Creek Yards. $1,000,000.

CONTRACTS AWARDED

New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, land and river borings for Narrows Vehicular Tunnel, and approaches at Brooklyn and Richmond Boros, to Giles Drilling Co., 10 West 14th St., New York, $17,710. Noted Oct. 2.

GRADE CROSSINGS

PROPOSED WORK

Mass., Revere—Commonwealth of Massachusetts, Metropolitan Dist. Comn., 1 Ashburton Pl., Boston, preliminary plans overpass carrying Revere Beach Parkway over Broadway. Est. exceeds $25,000.

N. Y., Angelica — Pittsburgh, Shawmut & Northern R.R., J. D. Dickson, receiver, St. Mary's, Pa., reconstructing railroad bridge carrying railroad over Belvidere-Transit Bridge-Angelica Co. Hy., Allegany Co.

N. Y., Brutus—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Brutus Street Crossing, east of Weedsport Station, Cayuga Co. $189,000.

N. Y., Chenango — Delaware, Lackawanna & Western R.R. Co., G. J. Ray, ch. engr., Hoboken, N. J., eliminating grade crossing at Bridge County Highway, at Chenango Bridge Station, Broome Co. $126,000.

Va., Richmond—Chesapeake & Ohio R.R. Co., Richmond, C. W. Jones, ch. engr., authorized construction undergrade crossing at Magnolia St. $25,550.

BIDS ASKED

B. C., New Westminster — See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., Genesee Falls—Pennsylvania R.R., T. J. Skillman, ch. engr., Broad Street Sta., Phila., Pa., eliminating Castile Road Crossing west of Portageville Station, to Bates & Rogers Constr. Co., 75 West St., New York, $88,333. Est. $109,297. Noted Sept. 11.

N. Y., Syracuse—Grade Crossing Comn., State Tower Bldg., eliminating grade crossing at Midler Ave., to Walsh Constr. Co., South Warren St., $102,472. Noted Aug. 7.

Ohio—R. N. Waid, dir. Hys., Columbus, constructing grade separation, consisting of concrete overhead roadway, Tuscawaras Co., to W. M. Brode Co., Inc., Newcomerstown, $66,490. Noted Oct. 2 under "Bridges."

O., Toledo—New York Central R.R., F. B. Freeman, ch. engr., New York, N. Y., rein.-con., steel grade separation Monroe St., to Walsh Constr. Co., 2001 Scranton Rd., Cleveland, est. $500,000.

B. C., New Westminster—City, diverting 12th Ave at Columbia St. to eliminate grade crossings, day labor. $150,000. H. Stewardson, City Hall, engr.

DAMS

CONTRACTS AWARDED

Que., Buckingham—Dpt. P. Wks., Parliament Bldgs., Ottawa, Ont., apron to dam, at Laupore Locks, Leivre River, near here, to V. E. Belanger, Buckingham, $19,623.

PIERS AND WHARVES

BIDS ASKED

Que., Tadoussac—Nov. 12, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., wharf improvements, Saguenay Co. $20,000.

CONTRACTS AWARDED

Que., Cap St. Ignac—WHARF—Dpt. P. Wks., Parliament Bldgs., Ottawa, Ont., reconstructing wharf, to J. E. Doucett & A. Gany, Levis, $8,715.

Que., Fox River—WHARF—Dpt. P. Wks., Parliament Bldgs., Ottawa, Ont., reconstructing wharf, to A. and C. H. Maddon, Chandler, $9,443.

AIRPORTS

BIDS ASKED

N. Y., Brooklyn—Nov. 6, by M. Cosgrove, comr. Docks, erecting, installing enclosure for parking of motor vehicles at Municipal Airport (Floyd Bennett Field), at Flatbush Ave., Contr. 1997.

GRAIN ELEVATORS

CONTRACTS AWARDED

Pa., Erie—GRAIN ELEVATOR—Pennsylvania R.R. Co., Broad St. Sta., 16th and Arch Sts., Phila., T. J. Skillman, ch. engr., W. D. Wiggins in charge, Penn. Sta., 1,300,000 bu. grain elevator, 110 ft. high, 20 ft. diam., rein.-con., Bay St., end of Holland St., to Rust Eng. Co., Koppers Bldg., Pittsburgh. Est. exceeds $300,000. Noted Oct. 23.

POWER AND LIGHTING

PROPOSED WORK

Ill., Evanston—City made plans and public hearing Oct. 30, ornamental lighting system, incl. 4,983 ornamental posts, either concrete posts requiring ornamental aluminum alloy grilles, ornamental grilles, ornamental aluminum alloy brackets for the two-lamp posts, 1,000 lb. ultimate strength, or steel posts, combined of c.i. and rolled metal, fluted steel shafts, c.i. parts, steel rods, 2,500 to 600 candlepower lights. $1,500,000. Hugh E. Young Co., 64 West Randolph St., Chicago, engrs. Noted Jan. 16.

N. Y., New York—Bd. Transportation, 250 Hudson St., rejected bids Oct. 10, furnishing, installing telephone equipment and emergency alarm equipment for portion Independent System City-owned Subways. Will readvertise. Noted Sept. 25.

BIDS ASKED

Mass., Boston—Nov. 19, by Traffic Comn., 154 Berkley St., automatic traffic control signal system equipment, Unit 2.

N. J., Plainfield—Nov. 3, by Common Council, G. B. Wean, city clk., city Hall, furnishing traffic signal equipment. E. P. Goodrich, 175 5th Ave., New York, consult. engr.

Oklahoma—Nov. 3, by C. W. Latta, engr., May, 16 mi. electric transmission line from Laverne to May, and distribution system in May. $25,000.

SPORTS AND PARKS

PROPOSED WORK

Mass., Brockton — Y.M.H.A. and Y.W.H.A. Community Centre, L. Hellman, Brockton, soon lets contract 3 story, 110 x 120 ft., brick, steel, concrete gymnasium, swimming pool, Green St. and Legion Parkway, $150,000. D. Levy, 415 Lexington Ave., New York, archt. Noted Oct. 16.

N. J., Elizabeth—Bd. Educ., 417 South Broad St., preliminary plans playfield, drives, paths, pools, $25,000. A. P. Hughes, 417 South Broad St., secy.

N. J., North Long Branch (mail Long Branch) —S. A. McNair, 388 Ocean Ave., Long Branch, plans by H. I. Braun, 191 Bway., Long Branch. 1 story bath pavilion, incl. 350 bath houses, 150 lockers, reception and shower rooms, Ocean Ave. $150,000. Noted Oct. 16.

O., Oberlin—Oberlin College, E. H. Wilkens, pres., plans by Walker & Weeks, 2341 Carnegie Ave., Cleveland, 1 story, swimming pool. $150,000.

BIDS ASKED

N. J., Spring Lake—Bd. Boro Comrs., Boro Hall, bids about Nov. 15, general contract 2 story, basement, towers, brick, steel pavilion, bath houses, swimming pool. $160,000. E. H. Schmeider, 3rd Ave., archt. Noted Oct. 16.

CONTRACTS AWARDED

Mass., Wellesley—Maugus Corp., 40 Abbott Rd., concrete lockers, squash courts, Abbott Rd., to E. T. Madden & Son, 17 Allan Rd. Est. $25,000.

HEATING AND VENTILATING

BIDS ASKED

Mass., Pittsfield—General Electric Co., E. A. Wagner, genl. mgr., taking bids heating and plumbing in transformer tank shop, Tyler St. To exceed $25,000. Noted Oct. 23, under "Shops and Foundries."

CONTRACTS AWARDED

Conn., West Haven (br. New Haven) — Town, E. J. Grimes, chn. School Building Comn., heating and plumbing in grade school, West Main St., to F. H. Gilbert, 379 Center St.; electrical work, to A. A. McPherson Co., 538 Campbell Ave. Est. $25,000 or more. Noted Oct. 9, under "Schools."

Mass., Boston — Two Hundred Seventy-Six Marlboro St. Trust, 56 Ames Bldg., heating in co-operative apartments, 276 Marlboro St., to E. T. Keefe Co., 68 Shawmut Ave. Est. $25,000-$30,000. Noted June 5 under "Buildings—Residential."

Mass., Brighton (sta. Boston) City of Boston, Dpt. P. Bldgs., heating and ventilating in court house, to T. A. Hunter, 667 Washington St., Dorchester; electrical work, to C. L. DeVoe, 179 Summer St., Boston, est. $25,000. Noted Aug. 15 under "Public Buildings."

Mass., Cambridge—Harvard University, heating and plumbing in geographical building, to J. S. Cassedy Co., 133 Austin St.; electrical work, to Lord Electric Co., 303 Columbus Ave., Boston. Est. $25,000 or more. Noted June 26, under "Schools."

Mass., Lynn—Equitable Co-Operative Bank, 145 Munroe St., heating and plumbing in bank, Willow and Oxford Sts., to J. F. Morgan & Son, 67 Blake St.; electrical work, to Fuller Electric Co., 73 Summer St. Est. $25,000. Noted Oct. 9 under "Banks."

Heating and Ventilating (Continued)

Mass., Mattapan — City of Boston, Library Dpt., heating in library, Hazelton St., to Brown Bros., 610 West Park St., Dorchester; plumbing, to F. B. Connor, 4 Davis St., Boston; electrical work, to J. Wilkinson & Co., 206 State St., Boston. Est. $25,000 or more. Noted Sept. 18 under "Public Buildings."

N. Y., Graniteville — Bd. Educ., 500 Park Ave., New York, heating in P. S. 22, to D. J. Rice, Inc., 606 1st Ave., New York, $45,670; plumbing, to R. W. Baylor, 9 Sommers Pl., Port Richmond, $12,287; electrical work, to Yarmark Electric Co., 305 Bway., New York, $16,600. Grand total $74,557. Noted June 19.

UNCLASSIFIED

PROPOSED WORK

Calif., Long Beach—RETAINING WALL and WALK—City, retaining wall and walk along central breach from Alamitos Ave. to 20th Pl. $400,000. H. Paterson, city engr.

Conn., Bloomfield—RADIO STATION—Doolittle Radio Corp., 5 Beecher Ave., New Haven, soon lets contract 1 story, 20 x 30 ft. frame radio station, two 165 ft. towers, radio transmitting equipment. Structural steel contract awarded to Foundation Constr. Co., 50 State St., Hartford. A. W. Boylen, 19 Whitney Ave., New Haven, archt.

Ky., Horse Cave—OIL PIPE LINE and WELLS—Stoll Oil Refining Co., 227 West Main St., Louisville, 12 mi. 2- to 4-in. underground pipe line to Hart County oil fields, drilling additional wells. Private plans.

La., New Orleans—SHED and SPRINKLER SYSTEM—Dock Bd. shed and sprinkler system for storage 50,000 bales cotton.

La., New Orleans—SPRINKLER SYSTEM—Dock Bd. sprinkler system for whole dock system. Probably $500,000.

N. Y., Brooklyn—METAL SHED—Brooklyn Edison Co., 380 Pearl St., 1 story, 50 x 175 ft. Hudson Ave. and Marshall St. Work may be done by day labor. Private plans.

Okla., Buffalo—GAS SYSTEM—Buffalo Pub. Serv. Co. franchise election Nov. 12, natural gas system. $45,000. Private plans. E. F. Camp, mayor.

Pa., Monaca—RAIL RIVER TERMINAL—Pittsburgh & Lake Erie R.R. Co., Pittsburgh Terminal Bldg., Pittsburgh. A. R. Reymer, ch. engr., rail river terminal. $500,000.

R. I., Providence—LABORATORY—New England Headquarters Bell Telephone Laboratories sketches by Voorheess, Gmelin & Walker, 101 Park Ave., New York, brick, steel laboratory. To exceed $40,000.

Tex., Fort Worth—FREIGHT TERMINAL—See "Buildings—Unclassified."

BIDS ASKED

Maryland—ELECTRICAL WORK—Nov. 5, by State Roads Comn., Baltimore, C. C. Uhl, chn., all electrical work necessary to complete electric lighting system for railroad grade crossing elimination at Cockeysville. Contr. B-168-45, Baltimore Co.; adv. E. N.-R. Oct. 30.

N. J., New Brunswick—RADIO STATION—C. MacKenzie, archt., 119 Broad St., New York, bids about Nov. 15, general contract brick, steel, Easton Ave., for R.C.A., 66 Broad St., New York. $2,000,000. Noted Sept. 18.

N. Y., Ithaca — ELEVATOR — Nov. 12, by Commissioner Dpt. Educ., State Educ. Bldg., Albany, electric elevators, Plant Industry Building, New York State College of Agriculture, Cornell University; adv. E. N.-R. Oct. 30.

N. Y., Ogdensburg—EXIT FACILITIES, etc. —Nov. 19, by Commissioner Mental Hygiene, State Office Bldg., Albany, exit facilities, fire stops at St. Lawrence State Hospital.

N. Y., Pine Aire Station — SERVICE TUNNELS, etc.—Nov. 12, by Commissioner Mental Hygiene, State Office Bldg., Albany, service tunnels, service connections at Pilgrim State Hospital.

N. Y., Yorktown—PROTECTION WORK—Nov. 10, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, structural steel, rein.-con. protection for Turkey Mountain Brook Syphon, on Bronx Parkway extension. Contr. 309. J. Downer, ch. engr.; adv. E. N.-R. Oct. 30.

CONTRACTS AWARDED

N. Y., Attica—CELL BLOCK—Commissioner Correction, State Office Bldg., Albany, prison steel for cell block, to Globe Iron Wks., 255 Walton Ave., New York. $289,763. Noted Oct. 9.

N. Y., Newark — TUNNELS — Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, constructing service connections (tunnels), at Newark State School, to Stewart & Bennett, Inc., 126 North Water St., Rochester, $11,490; addition boiler capacity and heating work to Heat Control Service Co., 3102 Clarendon Rd., Brooklyn, $102,500. Contracts awarded Oct. 6. Noted Sept. 18.

N. Y., Yonkers — COMFORT STATION — Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, comfort station at Tibbetts Brook Park, to A. Sabino, Mount Vernon. Noted Sept. 11.

MATERIALS

PROPOSED WORK

SEWER PIPE — Manchester, Vt. — Village purchasing 8, 10 and 12 in. vitr. sewer.

BIDS ASKED

SPECIAL CASTINGS and WEIGH LARRY—**Chicago, Ill.**—Nov. 5, by City, Dpt. P. Wks., City Hall, furnishing and delivering 128 tons Standard special castings for 3- to 42-in. water pipe, at various pipe yards; designing, fabricating, delivering 2-ton weigh-larry. Wm. Hale Thompson Plumbing Station, 49th St. and Western Ave. R. W. Wolfe, comr.

LUMBER — **Knoxville, Ia.** — Nov. 12, at office Auditor Marion Co., 6 car loads lumber and piling.

OIL ASPHALT, etc.—**Florida**—Nov. 10, by State Road Dpt., Tallahassee; **(P. means Project)**, furnishing 18,400 gal. T-C-2 Prime, 26,100 gal. oil asphalt winter viscosity and 1,460 tons slag or crushed gravel for surface treatment, f.o.b. cars, Crestview, for P. 819, Okaloosa Co.; 24.1 M. F. B. M. untreated timber, 3,500 lin.ft. 20, 25 and 30 ft. untreated pilings, f.o.b. cars, Indiantown ,P. 913, Martin Co.; 39.97 M.F.B.M. untreated timber, 4,000 lin.ft. 20, 25 and 30 ft. untreated pilings, f.o.b. cars, Sherman, P. 912, Okeechobee Co.—hauling 16,500 tons lime rock from railroad siding at Carrabelle to relocation of Rd. 10, P. 685, Franklin Co. B. M. Duncan, state hy. engr.

PIPE and SPECIALS—**New Orleans, La.**—Nov. 3, by J. M. McGowan, Labor Material Percentage Contractor for Sewerage & Water Bd., 526 Carondolet St., 5 cars 8 in. terra cotta pipe and specials, 3 cars sewer brick, castings, manholes for Sewerage & Wate Bd., 526 Carondolet St.

BITUMINOUS ROAD SURFACING MATERIAL — **New York, N. Y.** — Nov. 6, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 100,000 gal. bituminous road surfacing material, asphalt road oil, for cold application (dust layer).

TREATED and UNTREATED TIES — **New York, N. Y.**—Nov. 7, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., treated and untreated ties and contract rail protection boards for use in Rapid Transit Railroads. (Order 13).

PORTLAND CEMENT — **Phila., Pa.** — Nov. 10, by C. E. Smith, purch. agt. Pennsylvania R.R. Co., Broad Street Sta., Contr. 28-1930. portland cement.

CONTRACTS AWARDED

CABLE—**Pasadena, Calif.**—City Bd. Directors 15,221 ft. cable for light and power department, to Anaconda Wire & Cable Co., 336 East 4th St., Los Angeles, and General Electric Supply Corp., Los Angeles, $7,687; 16,673 ft., to General Cable Corp.,, 465 10th St., San Francisco, $19,508; 8,325 ft., to Okonite-Callender Cable Co., 110 North Alameda St., Los Angeles. $4,848. Grand total $32,043.

BRIDGE PLANK—**Mt. Pleasant, Ia.**—Henry Co., 100,000 ft. standard sawed rough fir lumber, to Morris Lumber Co., Eugene, Ore., at $28.90 per 1,000 ft.; steel and iron materials, to Scully Steel & Iron Wks., 2364 South Ashland Ave., Chicago, Ill., $2,810. Noted Oct. 1.

STEEL POLES—**Detroit, Mich.**—Dpt. Street Railways, St. Jean and Shoemaker Aves., one hundred and fifty 5, 6 and 7 in. 30 ft., sectional tubular steel poles, to Electric Railway Equipment Co., 622 Broadway St., Cincinnati, O., at $50.44 each, total $7,566.

EQUIPMENT

PROPOSED WORK

FIRE HYDRANTS — Stockton, Calif. — City purchasing 5 fire hydrants. $2,500. W. B. Hogan, city mgr.

BIDS ASKED

GRADER, etc.—**Corona, Calif.**—City, A. M. Hickley, city clk., taking bids 8 to 10 ton gasoline roller and 9 ft. grader.

GRADERS—**Sacramento, Calif.**—Nov. 17, by State Purchasing Agent, P. O. Box 621, 15 more or less heavy duty 8 ft. leaning wheel graders with scarifier attachments, ten more or less 8 ft. and five more or less 7 ft. without attachments, all equipped with rubber tired roller bearing wheels.

SNOW PLOWS—**Montezuma, Ia.**—Nov. 6, at office Auditor Poweshiek Co., 3 snow plows for use on No. 60 caterpillar tractors.

GAS SHOVEL or DIGGER—**Cambridge C, Mass.**—Owner, P. O. Box 22, in market gas shovel or digger.

STREET SIGN PLATES—**New York, N. Y.** —Nov. 6, by J. Miller, pres. Manhattan Boro Municipal Bldg., 2,000 enameled street sign plates.

SUCTION DREDGE — **San Antonio, Tex.** — City, c/o C. M. Chambers, mayor, taking bids one 8 in. suction dredge installed completely with boat on Woodlawn Lake.

TRACTOR, etc.—**Brownsville, Tex.**—Nov. 10, by Cameron Co., c/o O. C. Dancy, Brownsville, 1 crawler type tractor, 60 drawbar hp. or more, one 12 ft. leaning wheel grader, 1 crawler type motor grader with 128 in. blade.

TIRES and TUBES—**Virginia**—Nov. 5, by State Hy. Comn., Richmond, requirements for pneumatic, balloon, heavy duty solid tires and tubes for use during 6 mo. period from Nov. 15 to May 15, f.o.b. Fulton Warehouse, Richmond. $40,000.

FOREIGN

Africa — Government of Nyasaland (British Protectorate), awarded contract 2 mi. bridge across the Zambesi River, to Cleveland Bridge Co. of England, London, England. $7,500,000. Government will expend $16,000,000 improving its communications with coast.

Australia, Sydney — Fuller Brush Co., 153 Court St., Hartford, Conn., plans brush factory. To exceed $40,000.

Jugoslovia — Ministry of Public Works & Traffic, Belgrade, taking bids constructing roads-railways. $36,000,000.

New Zealand, Wellington—Nov. 22, by Secretary (Stores Div.), General Post Office, supplying, delivering 1,200 ft. cordage switchboard and 3 conductor, reel unmounted; and Dec. 9 for 200 transformers.

New Zealand, Wellington—Dec. 15, by Secretary (Stores Div.), General Post Office, 150 transmitters.

Buildings

RESIDENTIAL

BIDS ASKED

Mass., Falmouth Heights — G. B. Moreu Commander Hotel, 16 Garden St., Cambridge, taking bids 3 story, basement, brick hotel, concrete found., Grand Ave. $300,000. Silverman & Brown, 51 Cornhill, Boston, archts. Noted Sept. 18.

Mass., Medford (br. Boston)—See "Contracts Awarded."

N. J., Newark — Oct. 31, by E. E. Stout, engr. and archt., Gibraltar Bldg., general contract six 5 and 6 story, brick, steel, model apartments, Evergreen and Frelinghuysen Aves., for Prudential Insurance Co., Prudential Bldg. Est. $1,000,000.

N. Y., Bayside—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Long Island City — See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., New York—T. W. Lamb, archt., 644 8th Ave., taking bids separate contracts 17 story, 15 West 96th St., for Seven West 96th Street Corp., c/o D. A. Harrington, Jr., pres., and Goodwin Contg. Co., contractors, 370 Madison Ave. Noted Oct. 23 under "Contracts Awarded."

N. C., Charlotte—Mecklenburg County Land Corp., Charlotte, K. M. Murchison, pres., 101 Park Ave., New York, soon lets contract 18 story hotel. Total est. $1,700,000. Hotel Independence, c/o owner, lessee. Theatre portion of project in abeyance, R. K. O. Theatres, 1564 Bway., New York, probable lessee. K. Murchison, archt., W. H. Gompert, assoc. archt., and F. N. Bolles, mechanical engr., all of 101 Park Ave., New York. Noted June 16 under "Contracts Awarded."

Vt., Newport—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Glendale — Littchen-Reich Syndicate, Central Bldg., Los Angeles, 4 story, basement, brick, stone, North Brand Ave., to L. Reich, Central Bldg., Los Angeles. Est. $300,000.

Calif., Los Angeles — Owner, 5 story, basement, 60 x 180 ft., rein.-con., stone, west side, to W. D. Lee, 709 Textile Center Bldg., $200,000.

Calif., Los Angeles—J. Everett, Romaine St., 4 story, basement, 60 x 125 ft., brick, steel, to A. J. Showalter, 4637 West 18th St., $155,000.

Calif., Los Angeles—M. L. Smith, c/o W. D. Lee, archt., 709 Textile Center Bldg., 5 story, basement, 46 x 178 ft., rein.-con., timber, stone apartment, garage, Menlo St. between 10th and 11th Sts., to W. D. Lee, 709 Textile Center Bldg., $200,000.

Calif., Oakland—C. H. Burrell, archt., Amer. Bank Bldg., 6 story, basement, steel, concrete hotel, San Pablo Ave. near 40th St., to Dyer Constr. Co., May Bldg., $185,000.

Calif., San Francisco — V. Gullmes, 1203 Guerrero St., 6 story, steel, concrete, 25th and Fair Oaks Sts., to P. C. Fisher, 1122 Noe St., $150,000.

Ind., Hammond—T. E. Bielfield, general contract rein.-con., brick, 232 Indiana Ave., to C. Scott, 445 Lyons St. Est. $150,000.

Mass., Medford (br. Boston)—F. A. Greenley, 11 Spring St., Malden, 4 story, basement, brick, plain found., Bradlee Rd., separate contracts, $160,000. C. F. Springall, 50 Park St., Malden, archt.

N. J., South Orange—Morris Mandelbaum Associates, 7 East 42nd St., New York, two 3 story and 4 story, basement, 50 x 200 ft. brick, steel, stucco, plain founds., to Mandelbaum & Kemler, 7 East 42nd St., New York. Est. $350,000. Contractor now taking bids on separate contracts. Noted Oct. 23.

N. Y., Bayside—Ferris Constr. Corp., 117-02 111th Ave., 2 story, basement, 215th Pl. and Northern Blvd., day labor and separate contracts, $150,000. D. Levinson, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Brooklyn—Lenox Corp., J. Perlbinder, pres., 332 East 149th St., New York, 6 story, Lenox Rd. and Bedford Ave., separate contracts, $225,000. Franklin, Bates & Heindsmann, 2526 Webster Ave., New York, archts.

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Buildings—**Residential (Continued)**

N. Y., Long Island City—Dennington Building Co., 4301 45th St., 6 story, 84 x 200 ft., 46th St. and Queens Blvd., separate contracts, $275,000. Cohn Bros., 350 Stone Ave., archt.

N. Y., Long Island City — Island Housing Corp., 160-16 Jamaica Ave., Jamaica, 2 story, basement, 90th St. and 30th Ave., separate contracts and day labor, $150,000. A. Allen, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Long Island City—Roth Alliance, Inc., 59-37 Queens Blvd., 6 story, 100 x 168 ft., Queens Blvd. and 59th Pl., separate contracts, $250,000. A. Lama, 391 Fulton St., Brooklyn, archt.

N. Y., Long Island City—Whitney Constr. Co., 3420 28th Ave., 6 story, 85 x 125 ft., 30th Rd. and West 29th St., separate contracts, $150,000. C. Wuest, 32-02 30th Ave., Astoria, archt.

N. Y., New York—Rayan Building, Inc., S. Derfner, pres., 6 story, 84 x 187 ft., Pelham Parkway and Wallace Ave., separate contracts, $300,000. Becker & Levy, 349 East 149th St., archts.

Vt., Newport—Hall & McLean, 15 Main St., rebuilding 5 story, basement, 50 x 130 ft., brick hotel, to F. H. Sabourin, archt., Newport, by separate contracts. $150,000.

Wis., Shorewood — Annason Building Corp., 811 Wisconsin Ave., excavation, masonry and concrete work for 6 story, basement, 68 x 110 ft., East Capitol Dr., to E. C. Knuth, 2907 Fond du Lac St., Milwaukee. Est. $175,000.

CLUBS

PROPOSED WORK

Ill., Wilmette—Vista del Lago Club plans by Thielbar & Fugard, 520 North Michigan Ave., Chicago, 1 and 2 story club addition, Sheridan Rd., near here. $150,000.

N. J., Englewood—Englewood Women's Club, C. Packard, secy., 224 Glenwood Rd., sketches 2 story, basement, brick, steel, Lydecker St. $150,000.

N. C., Charlotte—Charlotte Country Club, c/o H. M. Wade, Charlotte, plans by Aymar Embury 2nd, 150 East 61st St., New York, clubhouse. $150,000. **Maturity after Dec. 1.** Noted Oct. 2.

BIDS ASKED

Ill., Wilmette—Thielbar & Fugard, archts., 520 North Michigan Ave., Chicago, taking bids 1 and 2 story club addition, Sheridan Rd., near here, for Vista del Lago Club. $150,000. Noted Oct. 23.

N. J., Freehold — E. H. Schmeider, archt., 3rd Ave., Spring Lake, bids about Nov. 15, general contract 2 story, basement, brick, steel club house, for Knights of Columbus. $150,000. Noted Oct. 16.

N. J., Hohokus—P. J. Jossier, archt., 240 Broad Ave., Palisades Park, bids about Nov. 15, general contract 2 story, basement, 90 x 180 ft., brick, steel, stucco golf club, plain found., for Owner, c/o architect. Noted Oct. 9.

N. J., Jersey City — J. F. Jackson, archt., 137 East 45th St., New York, bids about Dec. 1, general contract 7 story, basement, 100 x 100 ft., brick, steel building, Fairview and Bergen Aves., for Y.M.C.A., S. H. Lipscomb, genl. secy., 654 Bergen Ave. $250,000. Noted Jan. 23.

N. J., Weehawken—W. Mahnken, archt., 401 32nd St., Union City, bids about Dec. 1, general contract 3 story, basement, brick, steel club house addition, incl. bowling alleys, roof garden, 6th St. and Boulevard East, for B.P.O.E., 2 6th St. $150,000. F. J. Ricker, 685 Hudson Ave., West New York, assoc. archt. Noted Oct. 9.

CONTRACTS AWARDED

O., Youngstown—Y. M. C. A., J. L. Wick, chn., brick, steel, concrete building, West Federal St., to Louis Adovasio & Co., 939 West Federal St., $195,000.

HOSPITALS

PROPOSED WORK

Calif., Los Angeles—California Lutheran Hospital Assn., 15th and Hope Sts., plans by Walker & Eisen, Western Pacific Bldg., 2 story, basement, rein.-con., pressed brick, cast stone addition. $500,000.

Ill., Pekin—Pekin Public Hospital Assn., T. Elliott, chm. bd., bids after Nov. 1, 2 story, basement, rein.-con., brick, store addition, plain found., 14th St. $150,000. F. J. Klein, 331 Main St., Peoria, archt.

Ind., Indianapolis—Central Insane Hospital, West Washington St., plans by McGuire & Shook, 941 North Meridian St., rein.-con., brick men's building. $150,000.

Kan., El Dorado—Susan B. Allen Memorial Hospital revised plans by Washburn & Stookey, Ottawa, 3 story, basement, 42 x 122 ft., rein.-con., brick, stone. $150,000. Noted Sept. 25.

Mass., Boston—Boston Dispensary, R. G. Rotch, pres., 25 Bennett St., revised plans by Strickland, Blodgett & Law, 20 Newbury St., altering and constructing 4 story, basement, brick stone dispensary addition, plain found. $150,000. Noted Apr. 17.

Mass., Boston—New England Medical Center, J. A. Cousens, pres. Tufts College, revised plans by Andrews, Jones, Biscoe & Whittemore, 50 Congress St., and soon takes new bids Tufts Teaching Clinic, Nurses Home and Laboratory, 5 story, basement, 50 x 150 ft., brick, steel, plain found., Bennett and Ash Sts. To exceed $150,000. Former bids rejected. Noted Oct. 2.

Mass., Boston—City, Hospital Dpt., soon takes bids 3 story, basement, brick, limestone, rein.-con. pediatric pavilion (Children's Building) concrete found., Harrison Ave. $325,000. J. H. Ritchie & Associates, 250 Stuart St., archts. Noted Sept. 11.

Mich., Ann Arbor—University of Michigan Hospital plans by Fry & Kasurin, Ann Arbor, 2 story, brick, rein.-con., steel hospital addition for psychopathic department, plain found. $300,000.

Mich., Port Huron — Port Huron Hospital plans by Smith, Hinchman & Grylls, 800 Marquette Bldg., Detroit, 3 story, basement, brick, rein.-con., steel, plain found. $250,000.

Mich., Kalamazoo—Kalamazoo State Hospital plans by G. W. Graves, 233 John R. St., Detroit, 2 and 3 story, basement, brick, rein.-con. steel hospital group, incl. laundry additions, tuberculosis hospital, dining room, 180 patient infirmary.

Neb., Omaha—Lutheran-Missouri Synod, c/o C. Sherman, chn. Building Com., 1911 Deer Park Blvd., sketches brick, concrete hospital. $400,000.

O., Cincinnati—Comrs. Hamilton Co., Court House, plans by Sam Hannaford & Son, Dixie Terminal, 6 story, basement, rein.-con., brick hospital, plain found., Guerley Rd. $350,000.

Tenn., Nashville—City, sketches by Asmus & Clark, Nashville Trust Bldg., additions, alterations, improvements to General Hospital, Naace St. $500,000.

B. C., Vancouver—Provincial Govt., Victoria, plans by H. Whittaker, Dpt. P. Wks., Victoria rein.-con., psychiatric hospital. $300,000. P. Philip, Dpt. P. Wks., Victoria, engr.

B. C., Vancouver—Sisters of Charity of Providence, St. Pauls Hospital, Barrard St., plans by Gardiner & Mercer, Birks, Bldg., 6 story, basement, brick, rein.-con., 45 x 288 ft. hospital addition. Excavation contract let.

BIDS ASKED

Mass., Northampton—Oct. 31, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, brick, steel hospital ward and superintendent's cottage. $150,000. G. Robb, 14 Beacon St., Boston, archt. A. B. Franklin, 25 Haverhill St., Boston, engr. Noted Feb. 27.

N. Y., Wyantskill—Nov. 8, by Superintendent Pawling Sanatorium, altering and constructing 3 story, basement, 80 x 120 ft. sanatorium addition. Engineer Rensselaer Co., Troy, engr.

Ont., Toronto—Nov. 3, by Toronto Orthopedic Hospital, Bloor St. W., 2 story, basement, 140 x 140 ft., rein.-con., brick, stone hospital, at Church and Isabella Sts. $250,000. Horwood & White, 229 Yonge St., archts.

CONTRACTS AWARDED

Calif., Stockton—Bd. Comrs., San Joaquin Co., E. D. Graham, clk., general contract rein.-con., brick hospital, to E. H. Riley, Wolf Hotel Bldg., $196,428; plumbing and mechanical work, to Miller-Hays Co., Grant and Weber Sts., $41,473. Noted Sept. 11.

Conn., Hartford—St. Francis Hospital, Collins St., 4 story, brick, steel nurses home, Collins St., to W. O'Neil, 983 Main St. Est. $150,000.

Mass., Quincy—City of Somerville, T. J. McGrath, mayor, City Hall, altering and constructing 2 story, basement, brick, steel hospital addition, plain found., to M. S. Kelliher Co., 10 High St., Boston, $168,972. Noted Aug. 7.

Mass., Tewksbury—Commonwealth of Massachusetts, Dpt. P. Welfart, Boston, brick, steel women's hospital unit, plain found., and other improvements to S. Durso & Son, Market St., Lawrence. Noted Sept. 18.

Minn., Hopkins — Glen Lake Sanatorium Comn., E. C. Gale, chn., 1430 Rand Bldg., Minneapolis, general contract 3 story, basement, rein.-con., brick, stone service building, to Standard Constr. Co., 1111 Plymouth Bldg., Minneapolis, $86,525. Noted Sept. 18.

CHURCHES

PROPOSED WORK

Ind., Bloomington—Lutheran Church plans by A. Grindle, 109½ West 5th St., Bloomington, brick, rein.-con. church. $150,000.

Mass., Cambridge—Our Lady of Pity Roman Catholic Parish, W. C. O'Connell, archbishop, Boston, plans by J. G. Morissette, 575 Essex St., Lawrence, 3 story, basement, brick convent, concrete found., in North Cambridge Sect. $150,000.

Mass., Nantucket—St. Mary's Roman Catholic Church, J. M. Griffin, 8 Orange St., 1 story, basement, brick, Orange St. $150,000. Architect not selected.

Mass., Roxbury (sta. Boston)—St. Cyprian's Episcopal Church, D. L. Ferguson, pastor, sketches by C. C. Coveney, 184 Boylston St., Boston, 3 story, basement, brick parish house, 1075 Tremont St. $155,000.

N. J., Dunnellen — First Methodist Church plans by Poggi & Bradgon, 275 Morris Ave., Elizabeth, 2 story, basement, brick, steel parish house. $150,000. Noted Oct. 23.

N. J., Jersey City—Westminster Presbyterian Church, H. L. Wyatt, pastor, 304 Academy St., sketches by W. Neumann, 26 Journal Sq., 2 story, basement, brick, steel, Academy St. $200,000. Noted Oct. 8 Daily.

N. J., Leonia — Calvary Lutheran Church sketches 2 story, basement, brick, steel, Woodland Ave. $150,000. Noted Oct. 16.

N. J., Milltown—A. Merchant, archt., 1 Elm Row, New Brunswick soon lets contract 2 story, basement, brick, steel rectory, plain found., for Our Lady of Lourdes. $150,000.

N. J., West New York — First Church of Christ Scientist, J. E. Arth, pres. Bd. Trustees, 208 49th St., Union City, 2 story, basement, brick, Hudson Blvd. and East 10th St. $150,000. **Maturity indefinite.**

O., Youngstown—Martin Luther Congregation, J. F. J. Schellhase, pastor, 109 East Wood St., plans by W. E. Foster, 1900 Euclid Bldg., Cleveland, and H. F. Kling, assoc. archt., 314 North Phelps St., 1 story, stone, steel, concrete, Hudson and Clearmont Sts. $200,000.

Vt., St. Johnsburg—St. Andrew's Episcopal Church, S. H. Bennett, pastor, sketches by H. A. Lewis, 75 Westminster St., Providence, R. I., parish house. $150,000.

Ont., Ottawa—J. A. Ewart, archt., Jackson Bldg., bids early in 1931, church, 700 seating capacity, Bank St., for Calvin-Ottawa South United Church. $180,000. Noted Jan. 16.

Ont., Ottawa—Blessed Sacrament Parish, 4th Ave., plans by J. G. Morton, 61 Dixon St., Toronto, rein.-con., stone, steel, plain found., 4th Ave. $175,000.

BIDS ASKED

Ill., Peoria — Arcadia Presbyterian Church, Bigelow St., E. L. Ferandes, pastor, bids about Nov. 15, (1st unit) Sunday school, gymnasium, heating plant, (2nd unit) church, Bigelow St. $200,000. Hewitt-Emerson-Gregg, Peoria Life Bldg., archts.

N. J., South River—A. Merchant, archt., 1 Elm Row, New Brunswick, bids about Dec. 1, general contract 1 and 2 story, basement, tower, brick, steel, Main and Gordon Sts., for Methodist Church. $150,000. Noted Oct. 23.

CONTRACTS AWARDED

Conn., Hartford—St. Luke's Roman Catholic Church, Bishop Nilen, pastor, basement for 1 story, brick, stone church, to J. W. Clark, 88 Canterbury St. Total est. $150,000. Noted Sept. 18.

Ind., Terre Haute—St. Benedicts Catholic Church, general contract brick, steel, to Roehm Bros., 30½ North 5th St. Est. $150,000.

Pa., Monaca—First Presbyterian Congregation, O. H. Locke, chn. Building Com., 2 story, basement, 80 x 90 ft., L shaped, brick, hollow tile, stone, 13th and Indiana Sts., to Cook Anderson Co., 5th and Insurance Sts., Beaver. Est. $150,000.

La., St. Benedict — St. Josephs Abbey, A. Paul, abbot, 3 story, basement, 114 x 194 ft., rein.-con., brick, stone abbey, to A. LeBlanc & Son, Bogalusa. Est. $175,000.

Mass., Watertown — Union Church, J. W. Barnett, 1 story, basement, brick, stone, steel, plain found., Main and Gilbert Sts., to Hill & Delaney, 108 Mass Ave., Boston. Est. $150,000.

N. Y., New York — Franciscan Poor Clares, 328 Haven Ave., 3 story, 156 x 183 ft., monastery, school, to H. A. Harris, 16 East 43rd St. Est. $300,000. Noted Sept. 18.

O., Cleveland — St. Vitus Roman Catholic Church, B. J. Ponikvar, pastor, 1114 Norwood Ave., 1 story, brick, terra cotta, steel, concrete, church, parish house, East 61st St. and Vitus Ave., to Chas. Shutrump & Sons Co., 1900 Euclid Blvd. Est. $350,000. Noted Sept. 18.

Pa., Phila. — Second Baptist Church Congregation, Germantown Ave., C. R. McNaltry, 48 East Upsal St., pastor, 1 and 2 story, basement, 100 x 200 ft., brick, stone, plain found., to Sutton & Stephenson, Otis Bldg. Noted Aug. 7.

R. I., East Providence (br. Providence) — United Congregational Church, W. L. Wood, pastor, altering and constructing 1 and 2 story, basement, brick, stone addition, plain found., North Broadway, to Bowerman Bros., 70 Bath St., Providence. Est. $150,000.

SCHOOLS

PROPOSED WORK

Calif., Altadena—Pasadena Bd. Educ., sketches by Marston & Maybury, 25 Euclid Ave., Pasadena, Junior High School, 2 story, steel tile, brick. $300,000.

Calif., Los Angeles—University of Southern California, 3551 University Ave., plans by Cram & Ferguson, and S. E. Lunden, asso. archts., 400 Rowan Bldg., Edward L. Doheny Junior Memorial Library, limestone, on campus.

Calif., Madera—Madera High School Dist. sketches high school. $150,000 or more. Architect not selected.

Conn., New Canaan—Town, Bd. Educ., plans by John Noble Pierson & Son, 198 Jefferson St., Perth Amboy, N. J., Junior High School, 16 room, brick, steel, $275,000. Noted Oct. 23.

Ill., Chicago—Moody Bible Institute, La Salle St. and Chicago Ave., plans by H. B. Wheelock, 64 West Randolph St., 7 story, basement, L shaped, brick, stone, steel women's dormitory addition, incl. moving old buildings back, Chicago Ave. and La Salle St. $250,000.

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Schools (Continued)

Me., South Portland (br. Portland)—City, L. Q. Gerrish, supt. schools, Junior High School. $200,000. Architect not selected.

Mass., Arlington—Town, School Building Com., Bd. Selectmen, soon takes bids 2 story, basement, 160 x 175 ft., L-shaped, brick, limestone high school addition, concrete found., Mass. Ave. $275,000. G. E. Robinson, 80 Federal St., Boston, archt. Noted Sept. 11.

Mass., Attleboro—City, L. A. Fales, supt. School Dpt., grade school. $150,000-$200,000. Architect not selected.

Mass., Beverly — City, S. H. Chase, supt. schools, altering and constructing high school addition. $150,000 or more. Architect not selected.

Mass., Belmont—Town, W. E. Sperry, 350 Common St., plans by G. E. Robinson, 80 Federal St., Boston, 2 story, basement, brick, steel, School St. $150,000. Noted Oct. 16.

Mass., Boston—City, Dpt. School Bldgs., school, Brookline Ave. To exceed $150,000. Architect not selected.

Mass., Cambridge—Radcliffe College, A. L. Comstock, pres., 10 Garden St., sketches by Coolidge & Carlson, 89 State St., Boston, chemistry and physics building near college grounds. $400,000.

Mass., Dorchester (sta. Boston) — City of Boston, Dpt. School Bldgs. revised plans by J. M. Gray, 175 High St., Boston, 2 story, basement, brick, limestone, steel intermediate school, incl. gymnasium, hall, plain found., Gilbert Stuart Dist. $850,000.

Mass., Haverhill—M. and J. Bloomfield, c/o C. V. Badger, archt., 54 Merrimac St., soon takes bids 2 story, basement, brick, steel academy of music, plain found., Merrimac St. $150,000 or more. Noted Sept. 4.

Minn., Mapleton—Bd. Educ., J. H. Starley, clk., plans by G. Pass & Son and P. T. Rockey, Mankato, probably 3 story, basement, rein.-con., brick. $150,000 bonds voted for same. Noted Oct. 16.

Mass., Norwood — St. Catherine's Roman Catholic Church, J. F. Doherty, pastor, Nahatan St., altering and constructing school addition. $150,000 funds being raised for same.

Mich., Flint—Bd. Educ. plans by Malcolmsn & Higginbotham, 1217 Griswold St., 3 story, basement, brick, steel, stone, rein.-con. high school addition, plain found., Northern High School Site. $500,000.

Mo., Kansas City—Bd. Educ., plans by C. A. Smith, 800 Finance Bldg., Junior High School, rein.-con., brick, 64th St. and Agnes Ave., $500,000; 11 room addition to Border Star School, 6301 Nomell Rd., $150,000.

N. H., Derry—St. Thomas Aaquinas Roman Catholic Church, M. Redden, pastor, 26 Crystal St. plans by J. J. O'Shaughnessy, 80 Boylston St., Boston, Mass., 2 story, basement, brick, steel school, convent, plain found. $150,000 or more. R. D. Kimball Co., 6 Beacon St., Boston, Mass., engrs.

N. J., Avenel — Bd. Educ., School Bldg., 2 story, basement, brick, steel, plain found. $150,000. Architect not selected.

N. J., Elizabeth—Bd. Educ., 417 South Broad St., 2 story, basement, brick, steel, Clarkson Ave. $250,000. Project in abeyance. Noted Sept. 4.

N. J., Glen Rock (br. Ridgewood)—Bd. Educ., Boro Hall, 2 story, basement, brick, steel addition to School 2. $150,000. Architect not selected.

N. J., Hasbrouck Heights — Bd. Educ., Administration Bldg., will not build Junior and Senior High School, 2 story, basement, brick, steel, 3rd St. and Terrace Ave. $457,000. Project abandoned. Tooker & Marsh, 101 Park Ave., New York, archts. Noted Aug. 25.

N. J., Irvington (br. Newark) — Bd. Educ., 1253 Clinton Ave., sketches by V. A. Strombach, 1243 Springfield Ave., Junior High School, 3 story, basement, brick, steel, incl. gymnasium, auditorium, plain found., Myrtle Ave. and Delmar Pl. $950,000.

N. J., Jersey City—Bd. Educ., Harrison Ave., School 38, 3 story, basement, brick, steel, plain found. $1,150,000. Project in abeyance. J. T. Rowland, Jr., 30 Journal Sq., archt. Noted Apr. 10.

N. J., Phillipsburg—Bd. Educ., High School, sketches 2 story, basement, brick, steel, Ingersoll Heights. $150,000. Noted Oct. 16.

N. J., Princeton — Princeton Theological Seminary sketches by C. Z. Klauder, 1429 Walnut St., Phila., Pa., administration and social center, incl. chapel, gymnasium, dining hall, on campus between Alexander and Brown Halls. $900,000. **Maturity indefinite.** Noted Dec. 11.

N. J., Wyckoff—Bd. Educ., School Bldg., bids early in spring general contract 2 story, basement, brick, steel, Grand View Ave. $150,000. Tooker & Marsh, 101 Park Ave., New York, archts. Noted Oct. 9.

N. Y., Albany—St. Agnes School, bids probably in January, brick, stone school. Pember & Demers, 126 Washington Ave., archts.

N. Y., Hollis—Bd. Educ., 500 Park Ave., New York, soon takes bids general contract P. S. 35, Platina and Prospect Sts. $415,000. W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, archt. and supt. School Buildings. Noted May 15.

N. Y., New York—Bd. Educ., 500 Park Ave., soon takes bids P. S. 76, Adee, Bronxwood and Radcliffe Aves. $700,000. W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, archt. Noted May 15.

N. Y., Poughkeepsie — Vassar College Alumnae Assn., gymnasium and sports center. $500,000. **Maturity indefinite.**

O., Cincinnati—Bd. Educ., 511 West Court St., plans by C. F. Cellarius, St. Paul Bldg., 3 story, basement, rein.-con., brick, plain found., Bond Hill. $300,000.

O., Salem—City, Bd. Educ., J. S. Allen, supt., election Nov. 4, $385,000, 3 story, basement, concrete, brick, steel high school. Owsley Co., Federal and Chestnut Sts., Youngstown, archts. Noted Oct. 23.

O., Youngstown—City, 2 story, basement high school, Powersway and Buckeye Circle.$250,000. Architect not selected.

Ont., Ottawa—Reverend Christian Brothers 44 Cote St., Montreal, Que., plans by C. David, 1440 St. Catherine St. W., Montreal, Que., 3 or more story, basement, brick, concrete, stone. $500,000.

Ont., Toronto—Bd. Educ. plans by C. E. Dyson, 155 College St., Oakwood Collegiate Addition, Bedford School and Brock Ave., School Additions, 2 and 3 story, brick, stone, steel, concrete. $362,500.

Ont., Waterloo—Bd. Educ., J. C. Tweed, chn., plans by F. W. Warren, Federal Bldg., Hamilton, 2 or 3 story, basement, concrete, brick, steel, stone, Moore St. $165,000. Noted Oct. 2.

BIDS ASKED

Calif., Pasadena—Nov. 10, by Bd. Educ., 1 story, basement, 120 x 180 ft., rein.-con. high school auditorium. $150,000. Noted July 17.

D. C., Wash.—Nov. 5, by District Comrs., District Bldg., constructing Theodore Roosevelt High School.

Ill., Chicago — Nov. 12, by Bd. Educ., 188 West Randolph St., E. Withall, bus. mgr., Wendell Phillips Senior High School, rein.-con., brick, steel, stone, 50th and State Sts. $2,500,000. Former bids rejected. P. Gerhardt, 188 West Randolph St., archt.

Ind., Indianapolis—Nov. 11, by School Comnrs., School 69, rein.-con., brick, North Keystone Ave. from 34th to 35th Sts. $175,000. Harrison & Turnock, 1001 Architects & Builders Bldg., archts. J. M. Rotz Eng. Co., 704 Merchants Bank Bldg., engrs.

Mass., Hyde Park—Nov. 6, by Dpt. School Buildings, 11 Beacon St., Boston, 2 story, basement, brick, limestone, plain found., Elihu Greenwood Dist. $175,000.

N. J., Plainfield — J. S. Piggot, archt., 42 Walnut St., Newark, bids about Dec. 1, general contract 2 story, basement, brick, steel school, Liberty St., for St. Mary's Roman Catholic Church, P. A. Maher, pastor, 516 West 6th St. $300,000. Noted Sept. 25.

N. J., Sea Bright—Bd. Educ. bids about Nov. 15, general contract altering and constructing 2 story, basement, brick, steel addition, Riner St. $150,000. H. B. Seymour, 512 McClellan Ave., Long Branch, archt. Noted Oct. 16.

CONTRACTS AWARDED

Ark., Conway—Hendrix-Hardman College, 3 story, 60 x 130 ft. science hall. $150,000. Owner builds. Wittenberg & Deloney, Home Insurance Bldg., Little Rock, engrs.

Me., Lewiston—City, A. Bickford, supt. schools, 3 story, basement, 135 x 280 ft., brick, stone, granite high school, plain found., to E. F. Maxim Co., rear 518 Main St., $354,541; heating and ventilating to T. W. Kerrigan Co., 151 Lisbon St., $41,606; plumbing, to English & Dolliver Co., 276 Main St., $26,630; electrical work, to Androscoggin Electric Co., 134 Main St., 319,487. Grand total $442,264. Noted Oct. 9.

Mass., Ayer — Town, F. C. Johnson, supt. Schools, 3 story, basement, 65 x 125 ft., and 43 x 60 ft. school, to D'Amore Constr. Co., 89 State St., Boston, est. $150,000; plumbing, to P. K. McGuane, 92 East Main St.; electrical work, to L. B. Wilson, 18 East Main St., est. $25,000. Noted Oct. 2.

Mass., Somerville (br. Boston)—City, L. M. Conwell, mayor, altering and constructing 2 story, basement, brick, stone, steel addition to Junior High School, plain found., to Locatelli & Sullivan, 7 Davis Sq., $282,500. Noted Nov. 7, 1929.

N. H., Exeter—Phillips Exeter Academy, 4 story, basement, 80 x 140 ft. and 25 x 75 ft., brick, steel chemistry and science building, plain found., to G. B. H. Macomber Co., 38 Chauncy St., Boston, Mass., est. exceeds $150,000; heating and ventilating, to Buerkel & Co., 24 Union Park St., Boston, Mass., est. $25,000. Noted Oct. 16.

N. H., Lebanon—Sacred Heart Parish, J. Hogan, pastor, 3 story, basement, brick, steel convent, plain found., to J. E. White, Lebanon. Est. $150,000.

N. J., Keansburg—V. Eck., archt., 12 Broad St., Red Bank, general contract 2 story, basement, brick, steel, Carr Ave., to A. Domorski, 665 Cameron Rd., South Amboy, for St. Anne's Roman Catholic Church, Keansburg. Est. $150,000. Contractor requests bids on metal lath, plastering, painting, cast stone, blackboards. Noted Sept. 4 under "Contracts Awarded."

N. Y., Douglaston—Bd. Educ., 500 Park Ave., New York, general contract P. S. 98, to Raymore Constr. Co., 631 East Tremont Ave., $342,840. Noted July 24.

N. Y., New Paltz—Commissioner Dpt. Education, State Office Bldg., Albany, general contract practice school, at New York State Normal School, to Bedford Constr. Co., 1300 Broad St., Utica, $275,444; heating, to Worsfold & Havermale, Inc., Nyack, $36,994. Noted Oct. 2.

N. Y., Richmond Hill Circle—Bd. Educ., 500 Park Ave., New York, general contract P. S. 124, to Seaman Constr. Co., 145 West 27th St., New York, $183,490. Noted July 24.

N. Y., South Jamaica—Bd. Educ., 500 Park Ave., New York, general contract P. S. 123, to Spencer Forbes, Inc., 110 West 40th St., $141,637. Noted Aug. 28.

O., Cincinnati — University of Cincinnati, Clifton Ave., 3 story, basement, 139 x 163 ft., brick, rein.-con. school known as Memorial Hall, plain found., to Hodges Constr. Co., Chamber of Commerce, $350,000. Noted Sept. 18.

Wis., Port Washington—Bd. Educ. District 1, general contract 3 story, basement, 63 x 156 ft and 58 x 81 ft. high school, to Verhulst Co., Inc., 2221 Calumet Dr., Sheboygan, $128,500; electrical work, to A. C. Electric Co., 718 Winnebago St., Milwaukee, $4,400; heating, to Stoehr & London, Inc., 1707 Clybourn St., Milwaukee, $22,264; plumbing, to Wenzel & Henoch Co., 498 27th St., $8,360. Grand total $163,524.

THEATRES

PROPOSED WORK

Calif., Redding—T. and D. Jr., Enterprises, Inc., 25 Taylor St., San Francisco, sketches probably rein.-con. theatre, Market St. $150,000. Architect not selected.

Mass., Bourne—F. C. Small, mgr., Capitol Theatre, Main St., Buzzards Bay, 1 and 2 story, basement, brick, steel new Capitol Theatre, Main St. $150,000. Architect not selected.

Miss., Gulfport—Publix Theatres, 1501 Bway, New York, soon lets contract remodeling Strand Theatre. Private plans.

Tex., San Antonio—Fox Film Corp., c/o J. R. Grainger, vice pres. and genl. mgr., 850 10th Ave., New York, made tentative surveys, fireproof theatre. $1,500,000. **Maturity 1931.**

BIDS ASKED

N. J., Hackensack—Nov. 3, by T. W. Lamb, archt., 644 8th Ave., New York, general contract 1 and 2 story, basement, 125 x 200 ft., brick, steel theatre, 311 Main St., for Fox Metropolitan Playhouses, Inc., J. Leo, 850 10th Ave., New York. $1,000,000. Noted May 8.

O., Fremont—Nov. 8, by Paramount Publix Co., Paramount Bldg., New York, 3 story, basement, 85 x 165 ft., rein.-con., brick, incl. stores. $215,000. A. M. Strauss, 415 Calwayne Bldg., Fort Wayne, Ind., archt.

CONTRACTS AWARDED

Calif., West Los Angeles (br. Los Angeles)—Fox West Coast Theatres, Inc., Washington and Vermont Sts., 3 story, rein.-con., timber, Westwood Village, to H. I. Beller Constr. Co., 6513 Hollywood Blvd., Los Angeles, $200,000. Noted July 24.

Conn., Torrington—Warner Bros., 321 West 44th St., New York, theatre, to G. A. Zimmerman, 18 East 41st St., New York. Noted Sept. 25.

BANKS

PROPOSED WORK

Mass., Winchester—Winchester Co-operative Bank, J. Challis, pres., sketches by E. R. Walt, Lawson Rd. Extension, 2 story, basement bank, Vine St. $150,000 or more.

Va., Richmond—Morris Plan Bank, P. Wolcott, senior vice-pres., bank, Main and 8th Sts. $500,000 or more.

BIDS ASKED

Mass., Foxboro—Nov. 5, by Foxboro National Bank, E. H. Bristol, pres., and Hutchins & French, archts., 11 Beacon St., Boston, 1 story, basement, irregular sized, brick, limestone, concrete, steel, plain found., Cocassett St. $150,000. Noted Oct. 9.

N. J., Orange—Myers & Shanley, archts., 24 Walnut St., Newark, taking bids on revised plans from 5 lowest bidders, general contract altering and constructing 2 story, basement, brick, steel addition, for South Orange Trust Co., 53 South Orange Ave. $150,000. Noted Oct. 23.

CONTRACTS AWARDED

N. J., Union City — Crow, Lewis & Wick, archts., 200 5th Ave., New York, altering and constructing 2 story, basement, brick, steel addition to bank and office, to De Riso Bros., 551 5th Ave., New York, for Wechawken Trust Co., 980 Bergenline Ave. Est. $150,000. Noted Oct. 9.

Pa., Phila.—Thalheimer & Weitz, archts., 10 South 18th St., 3 story, basement, 41 x 100 ft., rein.-con., brick, steel, plain found., Broad and Chew Sts., to F. L. Hoover & Son, 1023 Cherry St. Est. $170,000. Noted Oct. 1.

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OFFICES

PROPOSED WORK

Calif., Hollywood—Amer. Medical Buildings Ltd., Los Angeles, F. E. Morgan, vice pres., plans by G. H. Wiemeyer, 911 Oviatt Bldg., Los Angeles, 2 story, basement, rein.-con. To exceed $150,000. **Maturity about first next year.**

Calif., Los Angeles—Amer. Medical Building Ltd., F. E. Morgan, vice pres., plans by G. H. Wiemeyer, 911 Oviatt Bldg., 12 story, rein-con., Wilshire Blvd. To exceed $150,000. **Maturity first of next year.**

Mich., Jackson—Lockwood, Greene & Co., archts. and engrs., Hanna Bldg., Cleveland, O., soon lets contract 2 story, basement, brick, steel, concrete office, for Sparks Withington Co. $150,000.

N. J., East Orange—C. Munna, 147 Halsted St., 2 story, basement, 100 x 100 ft., brick, steel office, stores, Central Ave. and Amherst St. $150,000. Project in abeyance. Noted Oct. 16.

N. J., Irvington (br. Newark)—United States Realty & Investment Co., 972 Broad St., Newark, plans by W. E. Lehman, 972 Broad St., Newark, 2 story, basement, 80 x 160 ft., brick, steel office, store, 1015-19 Springfield Ave. $150,000. F. and W. Grand, Inc., 151 Newark Ave., Jersey City, lessee.

N. Y., New York — Palais de France, c/o French Natl. Committee for Foreign Trade, French Consulate, will not build 65 story office, Central Park West and 62nd St. Project abandoned. Noted Aug. 22, 1929.

N. Y., New York—Corporation, c/o W. W. Ahlschlager, archt., 65 East Huron St., Chicago, Ill., or W. S. Sussman, 295 Madison Ave., New York, 24 story office, 6th Ave. and 41st St. $2,000,000.

Okla., Tulsa—Waite Philips, Philtower Bldg., plans by Smith & Senter, Philtower Bldg., 4 story, 140 x 150 ft., rein.-con., terra cotta addition to present 9 story office, 5th and Boston Sts. $500,000.

CONTRACTS AWARDED

N. Y., New York—Three Hundred Twenty-One West 44th St., Inc., H. M. Warner, pres., 10 story, 125 x 200 ft. office, film exchange, to F. T. Ley, 578 Madison Ave. Est. $300,000. Noted Sept. 18.

STORES

PROPOSED WORK

N. Y., Flushing—Michaels Bros. Furniture Co., 5th Ave. and 9th St., Brooklyn, plans by J. P. Whiskeman, 207 East 43rd St., New York, 5 story, 33 x 137 ft., stores, storage, workroom, office. Main St. $150,000.

BIDS ASKED

Calif., Los Angeles—Westmoreland Building Co., Westmoreland Ave. and Wilshire Blvd., taking bids (selected list of bidders) 2 story, basement, 174 x 175 ft., French Renaissance style, rein.-con., brick, steel, Wilshire Blvd. and Westmoreland Ave. $250,000. Walker & Eisen, Western Pacific Bldg., archts.

N. J., Montclair—Siegler & Greenberg, archts., 164 Market St., Newark, taking bids general contract 3 story, basement, 50 x 100 ft., brick, steel stores, apartments, plain found., Bloomfield Ave., for Essex County Holding Corp., c/o architect.

N. J., Sea Bright—Mulford Eng. Co., Plaza Sq., bids about Nov. 15, generla contract 1 story, basement, 100 x 100 ft., brick, steel stores, motor boat showrooms, timbers, concrete dock, Plaza Sq. $150,000. Private plans. Noted Oct. 16.

N. Y., Brooklyn — Kings Rugby Corp., A. Halperin, pres., 26 Court St., taking bids stores, apartments, East 51st and Clarkson Sts. $150,000. Some separate contracts awarded. Cohn Bros., 361 Stone Ave., archts.

CONTRACTS AWARDED

O., Cleveland—Cleveland Terminals Building Co., R. Sharpe, vice-pres. and genl. mgr., 12 story, 2 sub-basements, limestone, granite, steel, concrete department store, to Lundoff-Bicknell Co., B. F. Keith Bldg. Est. $10,000,000. Higbee Co., East 14th and Prospect Ave., lessee. Noted Aug. 28.

LOFTS

CONTRACTS AWARDED

Ont., Toronto—Syndicate, general contract 3 story, basement, 100 x 100 ft., concrete, brick, stone loft, to D. E. Bennett, 1001 Trust & Guarantee Bldg. Est. $150,000. General contractor will sub-let trades.

PUBLIC

PROPOSED WORK

Mich., Wyandotte—CITY HALL—City plans by H. J. Keough, 3440 Cass Ave., 5 story, basement, brick, steel, rein.-con., stone, plain found., Elm St. $190,000.

N. J., Caldwell — LIBRARY and CIVIC CENTER—Bd. Boro Council, Boro Hall, sketches by Guilbert & Betelle, 20 Bramford Pl., Newark, library and civic center, Westfield and Roseland Aves. $150,000. **Maturity probably soon.**

N. J., Elizabeth—COURT HOUSE—Bd. Freeholders Union Co., Court House, plans by Oakley & Son, 1259 Clinton Pl., 5 story, basement, brick, steel, rein.-con. addition, North Broad and Rahway Sts. $500,000. Noted Oct. 9.

Tex., Cotulla—COURT HOUSE and JAIL—La Salle Co. plans by H. T. Phelps c/o Hicks Bldg., San Antonio, 4 story, brick, stone, rein.-con. $150,000 voted for same.

BIDS ASKED

Ariz., Bisbee—COURT HOUSE and JAIL—Nov. 18, by Comrs. Cochise Co., c/o County Clerk, court house and jail. $300,000. R. Place, 11 East Pennington St., Tucson, engr. Noted Sept. 4.

N. J., Irvington (br. Newark)—FIRE HOUSE—Bd. City Council, 1253 Clinton Ave., bids about Dec. 1, 2 story, basement, brick, steel, Grove St. and 18th Ave. $150,000. G. F. Lederer, 2 Union Ave., archt. Noted Oct. 23.

N. J., Bayonne — FIRE HOUSES — Bd. City Comrs., City Hall, bids about Dec. 1, 2 story, basement, brick, steel, fire house. $150,000. L. Quien, 229 Broad St., Elizabeth, archt. Noted Oct. 16.

N. Y., Auburn — CELL BLOCK — Nov. 26 (extended date), by Commission Dpt. Correction, State Office Bldg., Albany, north cell block, mess hall, power plant, kitchen and bakery, foundry shop and new shop buildings, at Auburn State Prison. Noted Oct. 2.

N. Y., Dannemora—CELL BLOCK—Nov. 26, by Dpt. Correction, State Office Bldg., Albany, East Cell Block, new segregation building and laundry and bath building at Clinton Prison. Noted Sept. 18.

N. Y., Dannemora—DORMITORY—Nov. 25, by Commissioner Correction, State Office Bldg., Albany, general contract employees home, Dannemora State Hospital. Noted Oct. 9.

CONTRACTS AWARDED

Fla., Gainesville — INFIRMARY — State Bd. Control, P. K. Young, chn., Jacksonville, infirmary building at University of Florida, to Arthur R. Perry, Inc., Jacksonville, $78,970. Noted Oct. 2.

Tex., Corpus Christi—COURT HOUSE—Nueces Co., c/o N. Benton, judge, 4 story, brick, rein.-con. annex, plain found., to Geo. H. Belote Constr. Co., Corpus Christi, $120,000. Rejected bids on steel jail equipment, will readvertise. Noted Sept. 18.

Wash., Seattle—CITY LIGHT—L. E. DeCou & Associates, Burke Bldg., 25 story, 2 basement city light building, 3rd and Madison Sts., to Sound Constr. & Eng. Co., Northern Life Tower. Est. $2,225,000. City of Seattle, lessee.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Calif., Hollywood — LABORATORY and STUDIO — R. K. O. Radio Pictures Corp., sketches film laboratory, near Melrose and Gower Sts. $1,000,000. Architect not selected.

La., New Orleans—VEGETABLE TERMINAL—Southern Pacific Line, 201 St. Charles St., asked permission of City, to acquire site and construct vegetable terminal. $800,000-$1,000,000.

Mass., South Boston (sta. Boston) — EXPOSITION — New England States Century of Progress Exposition, J. S. Berger, mgr., 418 Chamber of Commerce Bldg., Boston, sketches by G. M. Meserve, 260 Tremont St., Boston, stucco exposition group, Columbus Park. To exceed $150,000.

N. J., Keyport—EXCHANGE—H. B. Brady, Inc., archts., 333 North Broad St., Elizabeth, soon lets general contract 2 story, basement, brick, steel, for New Jersey Bell Telephone Co., 540 Broad St., Newark. $150,000. Noted Oct. 23.

N. J., Lakewood — MOTION PICTURE STUDIO — Lakewood Studio Co., G. H. Glass, pres., c/o D. J. Scrocco, archt., 60 Park Pl., Newark, motion picture studio and radio broadcasting station, Pine Forrest Manor. $500,000. **Maturity indefinite.**

N. Y., New York — MARKET — Philip Ohl, lessee, 846 Amsterdam Ave., plans by N. Korn, 55 West 42nd St., 75 x 94 ft. market, stores, apartment, 846 Amsterdam Ave. $150,000. Architect now taking bids on excavation. Noted Oct. 23.

O., Cleveland — RECREATION CENTER — Shaarei Israel Congregation, Talisman, rabbi, 11503 Kinsman Rd., plans by M. Weis, 1836 Euclid Ave., 2 story, basement, brick, steel, concrete recreation center. $150,000.

Tex., Fort Worth — PASSENGER STATION and FREIGHT TERMINAL—Atchison, Topeka & Santa Fe R.R., W. W. Kelly, Amarillo, ch. engr. (Western lines), 2 story, 50 x 400 ft. passenger station, $600,000-$750,000, and freight terminal, $250,000, Jones St.

BIDS ASKED

N. Y., New York—MEMORIAL—Nov. 25, by Superintendent P. Wks., at office Bd. Trustees New York State Roosevelt Memorial Museum of Natural History, 15 West 77th St., for New York State Roosevelt Memorial. Noted June 13, 1929.

N. Y., New York — RESTAURANT and KITCHEN—Nov. 3, by H. Seagel, 1279 East 24th St., Brooklyn, general contract restaurant kitchen, 611 West 181st St. $150,000. L. A. Abramson, 25 West 45th St., archt. Noted Sept. 25.

R. I., Providence—HOME—Nov. 5, by Jewish Home for Aged, J. Hahn, c/o Krokyn & Brown archts., 120 Milk St., Boston, Mass., 2 story, basement, brick, stone, plain found., Morris Ave. $150,000. Noted Aug. 14.

CONTRACTS AWARDED

Kan., Wichita—COMMERCIAL—Brosius Investment Corp., Brown Bldg., 5 story, 100 x 120 ft., rein.-con., brick, terra cotta, to G. H. Siedhoff Constr. Co., Broadview Hotel. Est. $300,000. Montgomery-Ward & Co., Chicago Ave. and Larr St., Chicago, Ill., lessee. Noted Oct. 23, under "Contracts Awarded."

Mich., Detroit — ADMINISTRATION, etc. — Children's Foundation of Michigan, Frederick St., 3 story (ultimately 6 story), basement, brick, steel, stone, concrete administration and laboratory building, plain found., Frederick St., to H. G. Christman-Burke Co., Fisher Bldg. Est. $225,000.

N. J., Paterson—HOME—St. Francis Home, 25 Jackson St., general contract 2 story, basement, brick, steel addition, to J. Dunn, 550 East 34th St. Est. $150,000. Noted Sept. 18.

Tex., Houston—CAFETERIA—Forum Cafeteria Co. of America, 1222 Grand Ave., Kansas City, Mo., remodeling brick, to Base Constr. Co., Houston. Est. $300,000.

Tex., Midland—POST OFFICE—J. B. Thomas, brick, rein.-con., to A. J. Rife Constr. Co., Dallas, U. S. Govt., Post Office Dpt. lessee.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ill., Bloomington — MACHINE TOOL FACTORY and STORAGE—Keiser Van Leer, M. L. Van Leer, pres., sketches 2 story factory, Robinson St. $50,000. Architect not selected.

Miss., Jackson—GLASS BOTTLE PLANT—Dixie Glass Bottle Mfg. Co., W. M. Snyder, pres., glass bottle plant, Toledo Eng., Co., Security Bank Bldg., Toledo, O., engrs.

N. J., East Rutherford — FACTORY — East Rutherford Syringe Co., 75 Mozart St., will not build 2 story, basement, brick, steel, 54 Mozart St. Project abandoned. Noted Aug. 21.

N. J., Newark — FACTORY — M. and H. Machinery & Engineering Co., c/o A. W. Neuscheler, 40 Clinton St., plant and shop building Euclid Ave., Esther and Lockwood Sts. To exceed $40,000.

N. Y., Long Island City — FACTORY — Paragon Paint & Varnish Co., 47 10th St., general contract 100 x 100 ft. factory, 10th St. and Vernon Ave. Project in abeyance. $150,000. Noted Sept. 11.

O., Cincinnati — PICKLING — Hauser-Stander Tank Co., Spring Grove St. and Ammen Wm. Pl., plans by Lockwood Greene & Co., Hanna Bldg., Cleveland, 1 story, brick, steel, 70,000 sq.ft. floor space. $100,000. Private plans.

O., Cleveland—FACTORY—Cleveland Lithograph Co., C. Morgan, pres., East 17th St. and Payne Ave., 1 and 2 story, 55 x 100 ft., brick, steel, 1546 East 33rd St. $40,000. Private plans.

O., Middletown—PAPER BAG FACTORY—Raymond Paper Co., plans by Lockwood, Greene & Co., archts. and engrs., Hanna Bldg., Cleveland, 1 story, brick, steel, 110,000 sq.ft. floor space. $150,000.

Okla., Norman—ICE PLANT—Quick Kold Corp., Oklahoma Savings Bank, Oklahoma City, sketches dry ice plant. $40,000. Private plans.

Man., Winnipeg — MILL — Manitoba Rolling Mills, 875 Logan Ave., extending plant by constructing mill for re-rolling of rails into reinforcing steel and also into industrial rail sizes. $100,000.

N. S., Ingonish—PLANT—Arthena Mine Fishery & Packing Co. Ltd. new plant. $125,000.

BIDS ASKED

Calif., South Gate — FACTORY — Meyer & Holler, archts., Wright Bldg., Los Angeles, taking bids 1 story, 210 x 400 ft., brick, steel, for Rheem Mfg. Co., 4535 Horton St., Emeryville. $100,000.

Fla., Mulberry—PHOSPHATE PLANT—International Agricultural Corp., 61 Bway., New York, taking bids general contract steel, rein.-con., phosphate plant. $300,000. Private plans.

Ind., Evansville—DAIRY PLANT—Dec. 4, by S. Bell, aud. Vanderburgh Co., brick, steel dairy plant, power plant, brick stack, 2 steam boilers. $65,000. A. E. Neucks, 604 Old State Bank Bldg., archt.

Mass., Cambridge—PLANT—H. J. Shea & Co., c/o W. L. Galvin, archt., 30 Brattle St., taking bids 1 and 2 story, basement, 60 x 100 ft., brick, cleansing plant, plain found., Massachusetts Ave. opposite Ellery St. $50,000. Noted Oct. 16.

N. J., Bound Brook—FACTORY—Pathe Exchange, Inc., Middlesex Boro, taking bids 1 story, basement, brick, steel. $40,000. J. N.

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Factories and Mills (Continued)

Pierson & Son, 198 Jefferson St., Perth Amboy, archts. Noted Oct. 16.

N. J., Elizabeth—LAUNDRY—L. J. Keinig, archt., 40 Princeton Rd., taking bids general contract 1 and 2 story, basement, 45 x 65 ft. with 25 x 50 ft. wing, brick, steel 7th Ave. and East Jersey St., for Alexian Brothers Hospital, 7th Ave. and East Jersey St. $400,000.

N. J., Newark—BAKERY—Brownel Realty Co., c/o Dugan Bros., Inc., lessee, 161 Arlington Ave., bids after Nov. 1, general contract 1 story, basement, 50 x 100 ft., brick, rein.-con., plain found., 3rd St. and Abington Ave. $40,000. H. Holder, 242 Franklin Ave., Brooklyn, archt.

N. J., Paterson — DYE HOUSE — Radiance Piece Dye Wks., Inc., 373 North 11th St., Prospect Park, taking bids (selected list of bidders), 1 story, basement, 50 x 200 ft., brick, steel, rein.-con., plain found., East 25th St. $40,000. E. R. Coe, 136 Washington St., Paterson, archt.

N. J., Perth Amboy — DAIRY PLANT — Ballinger Co., archts., 100 East 42nd St., New York, taking bids on revised plans (from selected list of bidders) general contract 1 and 2 story, basement, brick, steel, for Industrial Realty Co., c/o architects., $40,000 or more. Puritan Dairy Products Co., 683 New Brunswick Ave., lessee. Noted Oct. 2.

Pa., St. Marys — CARBON ELECTRODE PLANT—Spear Carbon Co., D. Miller, genl. mgr., taking new bids from 5 low bidders, 1 story, 82 x 119 ft., corrugated siding, steel frame. $40,000. C. Lyons, St. Marys, ch. engr. Noted Oct. 9.

CONTRACTS AWARDED

Calif., La Verne — PACKING PLANT and PRE-COOLING PLANT—La Verne Co-operative Citrus Assn., 2 story, basement, 90 x 106 ft., rein.-con., La Verne St., own forces under supervision E. M. Mahl, La Verne. $75,000. Hamm, Grant & Bruner, Inc., 607 Ferguson Bldg., Los Angeles, archts.

Conn., Woodbridge—PLANT—Shepard Dairy, c/o L. J. A. Julianelle, archt., 42 Church St., New Haven, 1 and 2 story, brick pasteurization plant, to L. J. Coffey, 40 Autumn St., New Haven. Est. $40,000. Noted Oct. 9.

Ill., Decatur — STARCH PLANT — A. E. Staley Mfg. Co., A. E. Staley, Jr., vice pres., 3 story, 36 x 132 ft., rein.-con., brick, plain found., North 22nd St., to J. L. Simmons Constr. Co., Citizens Bank Bldg.; steam heating, plumbing, electrical work to be done by owners. Est. $100,000.

Ind., Indianapolis—FACTORY—J. R. Barrett, Pennsylvania and Henry Sts., general contract rein.-con., brick, steel, to C. J. Wacker, 3228 Central Ave. Est. $40,000.

Ind., Indianapolis — MILK PLANT — L. B. Weaver, Madison Ave and Belt R.R., general contract 50 x 65 ft., brick, steel, hollow tile Madison Ave. and Belt R.R., to E. J. Kirsch, 57 LeGrande Ave. Est. $40,000.

Ind., St. Meinrad—PRINTING PLANT—Abbey Press, E. Bierheide, supt., general contract 2 story, basement, 65 x 160 ft., brick, steel, to Tri-State Contg. Co., 522 Market St., Evansville. Est. $75,000. Noted Aug. 7.

Ia., Sioux City—BAKERY—M. & L. Bakery Co., c/o F. A. Maxeiner & F. W. Lenhart, 502 West 3rd St., general contract 2 story, basement, 88 x 183 ft. with 31 x 58 ft. wing, rein.-con., brick, to H. S. Holtze, Sioux City, $52,895. Noted Aug. 14.

Md., Baltimore—PLANT—F. Thomas, archt., 726 East 33rd St., 2 story, basement, 75 x 118 ft., ice cream manufacturing plant, brick, steel, rein.-con. to Frainie Bros., 19 West Franklin St., for Arundel Ice Cream Co., 1501 West Baltimore St. Noted Oct. 16.

Mass., Everett—PLANT—Merrimac Chemical Co., 3 story, 70 x 125 ft. alum building, brick, rein.-con., concrete found., to A. C. Peters, 46 Cornhill, Boston. Est. $60,000. Noted Oct. 23.

Mass., Lowell—FACTORY—Pratt & Forrest, 766 Dutton St., 1 story, basement, brick factory and storage, concrete found., School and Peery Sts., to R. Clough, Chelmsford. Est. $40,000.

Minn., Minneapolis—FACTORY—Strong-Scott Mfg. Co., 3rd St. S., 1 story, basement, 100 x 360 ft., brick, steel, concrete flour mill and grain elevator machinery factory, Taft St. between Traffic and Kennedy Sts., to Pike & Cook, 416 South 5th St. Est. $185,000.

N. J., Camden—FACTORY—Continental Can Co., c/o A. Zinn, Campbell Soup Co., 5 story, 129 x 161 x 339 ft., rein.-con., steel, caisson found., to Cramp Co., Denckla Bldg., Phila., Pa. Noted Aug. 28.

N. J., Hillside—FACTORY—Union Carbide & Chemical Co., subsidiary Carbide & Carbon Corp., 30 East 42nd St., New York, pyrofax gas factory, to Curtis & Mink, 11 Park Pl., New York. Est. $40,000. Noted Oct. 23.

N. J., Teaneck—LAUNDRY PLANT—Owner, c/o C. G. Mettburg, archt., 16 Depot Sq., general contract brick, steel, to P. Polizzi, 87 West Englewood Ave. Est. $40,000. Noted Oct. 9.

N. Y., Huntington — ICE PLANT — Long Island Ice Corp., c/o C. L. Weir, archt., 13 East 37th St., New York, 1 story, 30 x 155 ft. ice manufacturing plant, to P. M. Sterling, 230 Park Ave., New York. Est. $50,000.

O., Columbus—FACTORY—Jaeger Machine Co., 520 Dublin Ave., 1 story, 105 x 205 ft., brick, steel, concrete, Dublin Ave., to T. J. Schirtzinger, 1353 North High St., $50,000.

Pa., Farmers Valley—PIPE MILL—McKean County Refining Co., 2,500 bbl. steel, incl. small brick pumphouse, to E. B. Badger & Sons Co., 271 Madison Ave., New York. Est. $200,000.

Ont., Barrie—PACKING PLANT—Co-operative Packers of Ontario, T. Olsen, mgr., 2 story, basement, 85 x 135 ft., rein.-con., brick, vitr. tile, Main St., to Webb & Son, Mississaga St., Orillia. Est. $100,000. Noted Oct. 16.

Ont., Cornwall—SILK FACTORY—Cortaulds (Canada) Ltd., 2 story, 150 x 450 ft., brick, rein.-con., Montreal Rd., to Foundation Co. of Canada, Sherbrooke St., Montreal, Que., $250,000. Noted Oct. 9.

GARAGES

PROPOSED WORK

N. Y., Brooklyn—Nicholas Mastranda, 363 East 29th St., plans by Lama & Proskauer, 391 Fulton St., service garage, East 29th St. and Avenue D. $40,000. **Maturity in spring or summer.** Noted Oct. 9.

N. Y., Brooklyn—D. H. Yeoman, 89-15 187th St., Hollis, sketches by J. A. Boyle, 367 Fulton St., service garage, 54th St. and 21st Ave. $50,000.

N. Y., Long Island City—Eighteenth Avenue Building Corp., 463 7th Ave., New York, sketches by Thompson & Thompson, 191 Joralemon St., Brooklyn, 2 story, 100 x 125 ft. service garage, Haight St. and Sanford Aye. $200,000.

N. Y., Troy—Rathe Bros., 417-19 Grand St., bids late in November, altering and constructing 3 story, basement, 100 x 280 ft., brick, steel, rein.-con. addition to garage, Grand and Federal Sts. Engineer not selected.

R. I., Providence—E. G. Page, 255 Fountain St., plans by F. Chiaverini, 32 Broadway, 2 story, 75 x 155 ft., brick, steel service garage, super station and salesroom, plain found., Fountain St. $75,000.

BIDS ASKED

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., Brooklyn—J. Sholnik, 729 Avenue T, service garage, Adelphi St. and Atlantic Ave., day labor and separate contracts. $45,000. Bids on materials, etc. now. H. J. Nurick, 44 Court St., archt. Noted Oct. 9.

N. Y., New York—Consolidated Gas Co., 4 Irving Pl., 1 story, 62 x 201 ft. service garage, to Kenn-Well Contg. Co., 45 East 17th St. Est. $75,000. Noted Oct. 9.

N. Y., New York—Empire Architectural Iron Wks., 530 Truxton Ave., service and parking garage, 73rd St. and Avenue A, day labor and separate contracts. $200,000. Bids on materials, etc. now. W. C. Sommerfeld, 31 Union Sq., archt.

Pa., Phila.—Kent Automatic Parking Garage Investment Co., 350 Madison Ave., New York, automatic parking garage, 15th, Locust and Walnut Sts., to D. M. Love, Juniper and Walnut Sts. Est. $1,500,000.

SHOPS AND FOUNDRIES

PROPOSED WORK

O., Cincinnati—SHOP and WAREHOUSE—University of Cincinnati, D. Lawrence, clk., plans by Hunt & Allen, Eagle Savings & Loan Bldg., 2 story, brick, steel, concrete, Clifton Ave. $100,000.

BIDS ASKED

Calif., San Francisco—SHOPS and WAREHOUSE—See "Contracts Awarded."

Mass., Springfield — SERVICE — City, Dpt., Streets & Engineering, taking new bids 2 story, brick service building, plain found., Taylor St. Yard. $40,000. Former bids rejected. McClintock & Craig, 458 Bridge St., archts. Noted Oct. 9.

CONTRACTS AWARDED

Calif., San Francisco—SHOPS and WAREHOUSE—Soule Steel Co., 916 Rialto Bldg., 1 story, steel frame, day labor. $40,000. Noted Oct. 23.

Conn., New Haven—MACHINE SHOP—Connecticut Bearings Co., Inc., F. C. Bradley, 294 York St., 1 story, basement, 40 x 60 ft., 30 x 50 ft., brick, steel, machine shop, garage, store, to Thomas & Hobro, 20 Candee Ave., West Haven. Est. $40,000. Noted Oct. 16.

Mass., Quincy—SHOP—O. H. Comins, 731 Hancock St., Wollaston, rebuilding 2 story, brick, timber, shop, plain found., Hancock St., recently destroyed by fire, to J. Gutro, 31 Lancaster St. Est. $40,000.

Mass., Roxbury (sta. Boston)—TILE SHOP—Keramic Tile & Marble Co., 80 Boylston St., Boston, 1 story, 85 x 200 ft., brick, concrete, tile shop, plant unit, Prentiss St., to J. Loitherstein, 73 Cornhill, Boston. Est. $40,000.

Va., Clifton Forge—SHOPS—Chesapeake & Ohio R.R. Co., C. W. Johns, ch. engr., improving locomotive shops, to J. A. Fix & Sons, Lynchburg, $153,460.

POWER PLANTS

PROPOSED WORK

Arizona—Flagstaff Light Co., Flagstaff, installing 500 kva. generators in power plants at Flagstaff and Winston; 1,000 kva. generator at Holbrook Plant. G. T. Herrington, Flagstaff, genl. mgr.

Mass., Fitchburg—Crocker, Burbank Co., 545 Westminster St., power plant extension. $40,000 or more. F. J. Sill, East Main St., Westboro, engr.

N. Y., Rockaway—Dpt. Hospitals, Municipal Bldg., New York, soon takes bids power plant, hospital, help quarters, Rockaway Beach and 149th Blvd. $395,000. M. Bernstein, 2 Columbus Circle, New York, archt. F. Sutton, 140 Cedar St., New York, mechanical engr.

O., Cleveland — Acme Rayon Corp., P. S. Green, pres., 1294 West 70th St., plans by George S. Rider Co., Marshall Bldg., 1 story, brick, steel boiler house addition. $40,000.

BIDS ASKED

Ind., Evansville—See "Factories and Mills."

N. J., Jersey City — Nov. 3, by Bd. City Comrs., City Hall, 3 story, basement, brick, steel power house addition, laundry and tunnels, at Baldwin and Montgomery Sts. $800,000. J. T. Rowland, Jr., 30 Journal Sq., archt. Former bids rejected. Noted Oct. 16.

CONTRACTS AWARDED

Ill., Edwardsville—Nimrod Co., 1 story, brick, concrete, to Libetryville Constr. Co., Libertyville. Est. $40,000.

Ind., Goshen—Bd. P. Wks., C. E. Firestone, mayor, municipal electric plant new generating equipment, incl. three 900 hp. diesel engines and generators to Fairbanks-Morse & Co., 900 South Wabash Ave., Chicago, Ill., $238,681. Noted Sept. 25.

Mass., Boston—Beacon Laundry Co., 14 Lenox St., 1 story, concrete boiler house addition, to A. Bartington, 1 Washington St. Noted Oct. 16.

Minn., Thief River Falls — City, equipment for power house, to General Electric Co., River St., Schenectady, N. Y., and 630 1st Natl. Soo Line Bldg., Minneapolis, $5,350. Noted Oct. 23.

WAREHOUSES

PROPOSED WORK

N. Y., Long Island City—Crane Co., 836 South Michigan Ave., revised plans by C. Krieg, c/o owner, 3 story, basement, 172 x 173 ft. warehouse, shop, Dutch Kills Basin and 47th Ave. $350,000. Noted Nov. 15, 1929.

BIDS ASKED

Calif., San Francisco — Nov. 15, by S. J. Hester, secy. Bd. P. Wks., (1st unit) 2 story, rein.-con., 15th and Harrison Sts., for City and Los Angeles Co. $87,000. Total est. $150,000.

N. J., Passaic—J. Finkelstein, 165 Lafayette Ave., taking new bids general contract 1 story, basement, 100 x 120 ft., brick, steel, rein.-con., Exchange Pl. $150,000. H. Gerritsen, 118 Passaic Ave., Garfield, archt.

CONTRACTS AWARDED

Mass., Milton (br. Boston)—Milton Ice Co., 290 Central Ave., 1 story, concrete ice storage addition, concrete found., to Wm. T. Reed Co., 89 Broad St., Boston. Est. $40,000.

N. Y., New York—New York, New Haven & Hartford R.R. Co., R. L. Pearson, ch. engr., New Haven, Conn., 1 and part 2 story, 110 x 328 ft. steel, brick refrigerated warehouse, incl. driveways, covered unloading platforms, sidetracks, East 132nd St. opposite Locust Ave., to Austin Co., 120 Bway. Est. $175,000. Great Atlantic & Pacific Tea Co., 420 Lexington Ave., lessee.

See proposal advertising on page 93

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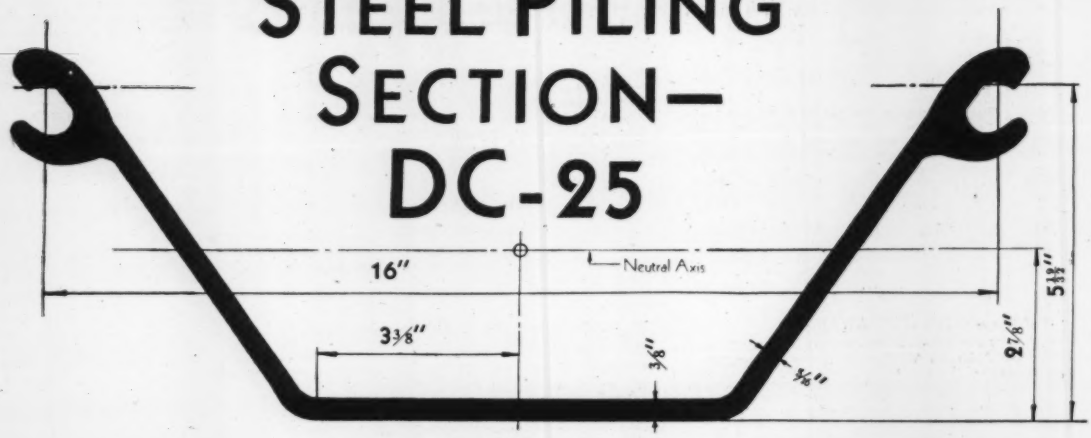
J&L announces a new STEEL PILING SECTION— DC-25



Designed for Added Stiffness and Deep Driving

THIS new J & L Deep Channel Steel Piling section, DC-25, embodies all the outstanding characteristics and advantages of the well established J & L sections EC-22, EC-23.75 and C-27, and, in addition, provides for greater section modulus, giving added stiffness to long piling. It is especially adapted to piling work where the wall pressure is great and where the conditions of the soil necessitate deep driving, to secure the proper grip for safely carrying the greater horizontal loads developed.

A combination of the DC-25 section and one of the other J & L piling sections makes an ideal wall of adequate beam strength with economy. In this design, for cofferdam construction, the DC-25 sections, used against waling, and the flexible sections, alternately driven on the water side of the cofferdam, give water tightness.

Write for further detailed information on this new and economical cofferdam design. There is no obligation.

J&L STEEL PILING

Properties of J & L Steel Piling	EC-22	EC-23.75	C-27	DC-25
Weight of Piling Bar per Lineal Foot	32.50 lb.	32.50 lb.	32.50 lb.	33.30 lb.
Weight per Square Foot of Wall	22.00 lb.	23.75 lb.	27.00 lb.	25.00 lb.
Moment of Inertia	9.42 in.^{4}	14.42 in.^{4}	23.19 in.^{4}	47.21 in.^{4}
Sections Modulus of Bar	5.20 in.^{3}	6.53 in.^{3}	8.19 in.^{3}	13.80 in.^{3}
Section Modulus per 12" of Width	3.50 in.^{3}	4.75 in.^{3}	6.77 in.^{3}	10.35 in.^{3}
Radius of Gyration	.994 in.	1.23 in.	1.56 in.	2.19 in.
Thickness of Wall	4.75 in.	6.125 in.	8.00 in.	11.25 in.

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